



2018年7月11-13日 上海

# Fluent Overset Mesh

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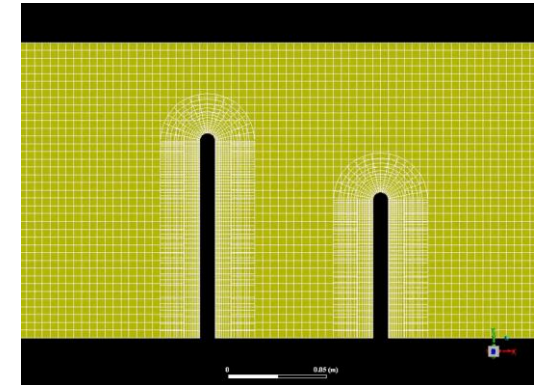
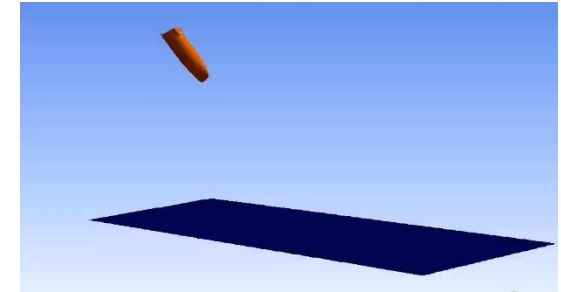
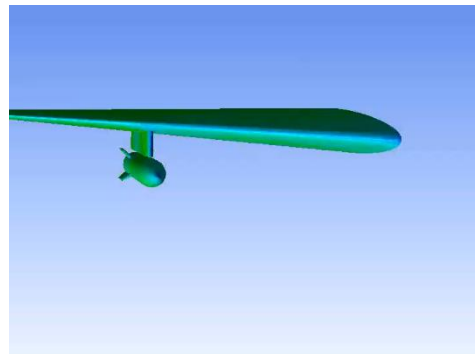
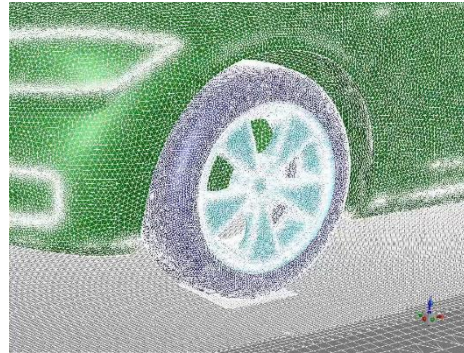
ANSYS



ANSYS

# Outline

- Overview
- How to Work
- Overset Workflow in Fluent
- Supported Features & Limitations
- Challenges & Tips
- Examples



# OVERVIEW

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# overview

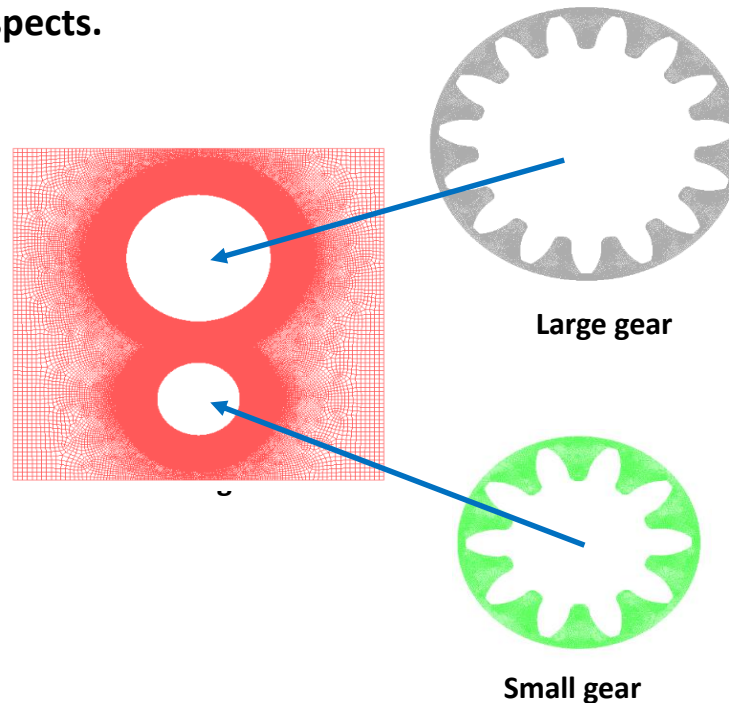
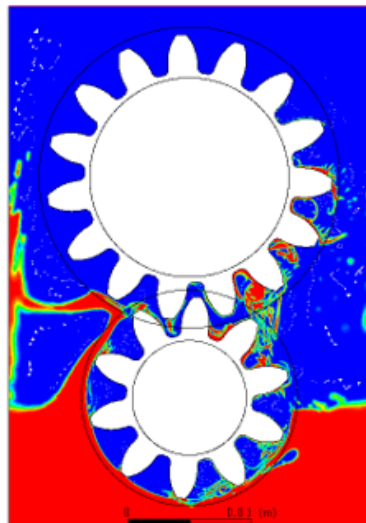
In this document, following points are explained.

What is Overset Mesh?

functions?

how to use?

Those are illustrated in fundamental aspects.

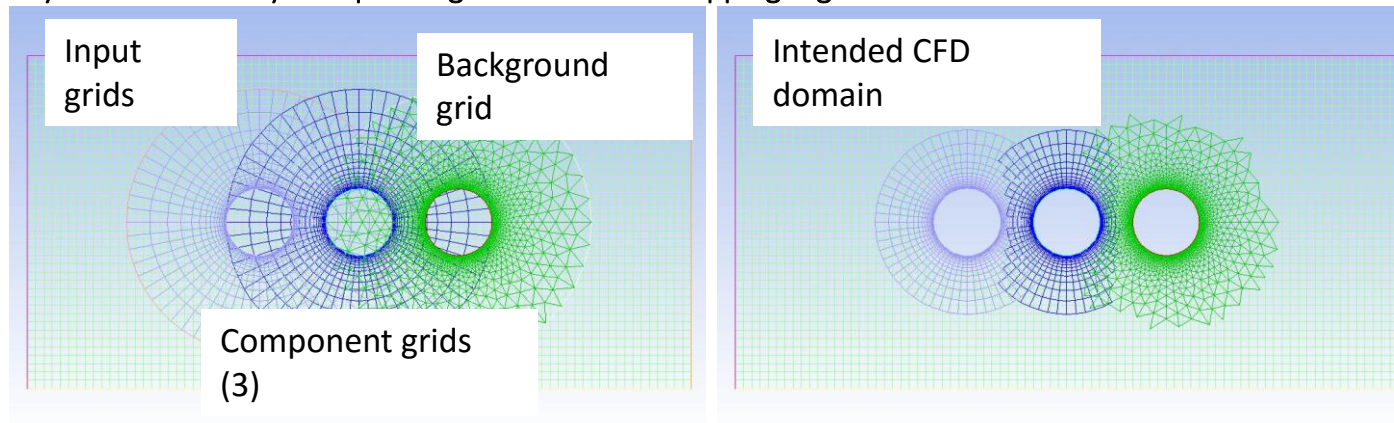




# What is overset (chimera) meshing?

## Method to build up computational domain from **parts** during simulation

- ✓ Multiple **overlapping** cell zones connected by overset interface
- ✓ **Components** are meshed individually and typically embedded in a **background** mesh
- ✓ Connectivity is established by interpolating cell data in overlapping regions



# Motivation for Overset Meshing in ANSYS Fluent

## ■ Extending current capabilities

- Easy to set up MDM
- Easy to change of initial position (no re-make mesh)
  - ✓ Better handling of relative mesh motion with small gaps (gears, pumps)
  - ✓ Avoid remeshing failures and setup issues as in dynamic mesh

## ■ Easy mesh creation

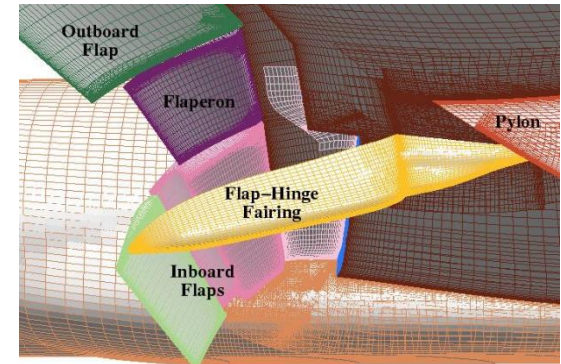
- Because you can create Background and Component meshes separately, no complicated operations such as blocking are required.

## ■ Possibility in free layout of parts

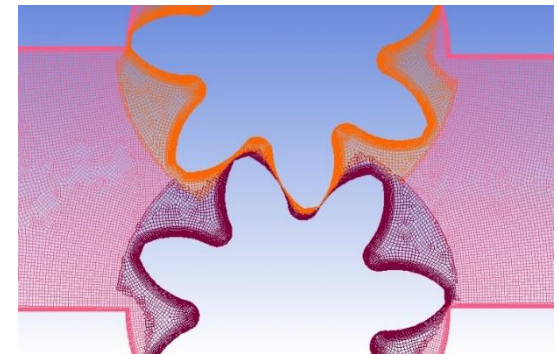
- Easier configuration changes and part swapping ( Making mesh is unnecessarily in following cases )
  - ✓ When you want to change the arrangement → Just move the component mesh
  - ✓ When you want to replace the parts → just change the component mesh

## ■ Solution quality

- Overset grids maintain grid quality during mesh motion
- Locally structured meshes in a generally unstructured grid



Rogers, 12<sup>th</sup> Overset Symposium



# History of Overset

Introduced from R17.0,  
every year the function is strengthened!!

R20.0~

further function  
up-date!!

R19.x

- MRF is OK
- All of k-e, k-w models
- Mixture model is OK
- Cavitation is OK
- Dedicated UDF

R18.x

- Moving mesh
- Density based solver
- 2<sup>nd</sup> order implicit (static mesh)
- Hybrid initialization
- All of k-w models

R17.x

- Official release
- Pressure based solver
- Turbulence ( a part of k-e,k-w)
- Energy is OK, VOF is OK
- Hybrid initialization
- All of k-w models

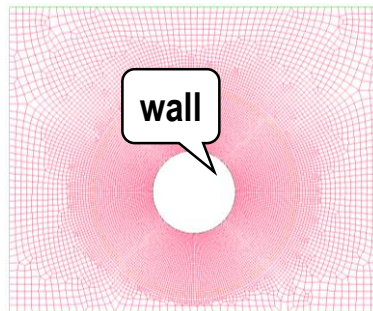
# How to work

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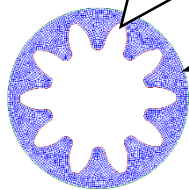
# overlapping

## 1 gear case



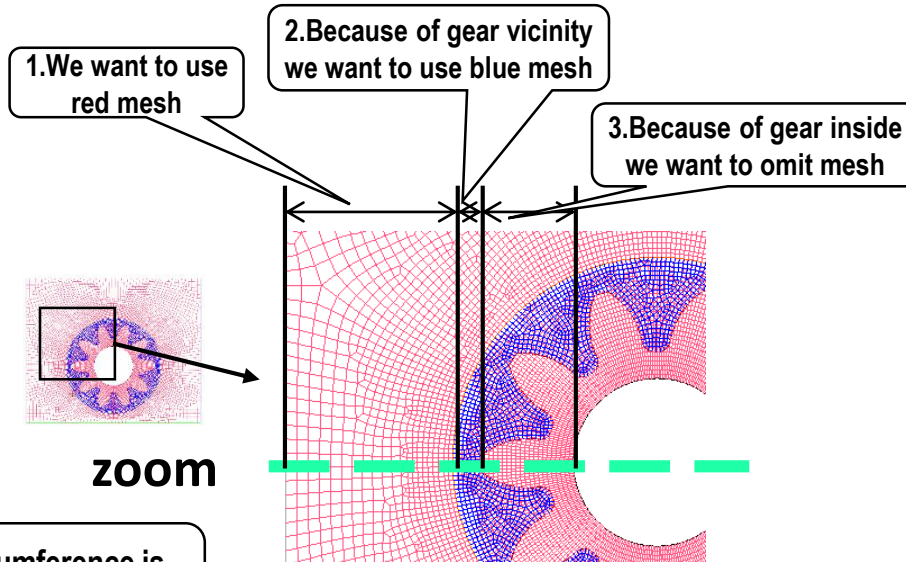
Background

Gear surface is wall



Component

## Treatment on following green line



zoom

Overset

Necessary mesh varies depending on position.  
We have to pay attention to how to connect  
meshes. So we have to understand cell  
treatment in overset.

# Overset terminology



- **Background grid**

- ✓ Cell zone which does not have a boundary zone of type overset
- ✓ Multiple background grid zones are connected conformally or non-conformally\*

- **Component grid**

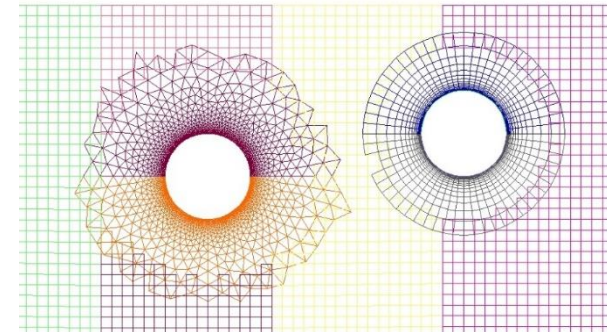
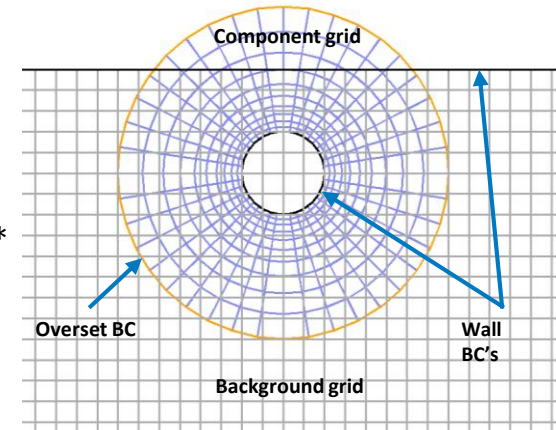
- ✓ Cell zone which has at least one boundary of type overset

- **Overset boundary**

- ✓ Boundary condition to designate where component grid is intended to communicate with other grids

- **Overset interface**

- ✓ Pairs one or multiple component grids with one or multiple background grids



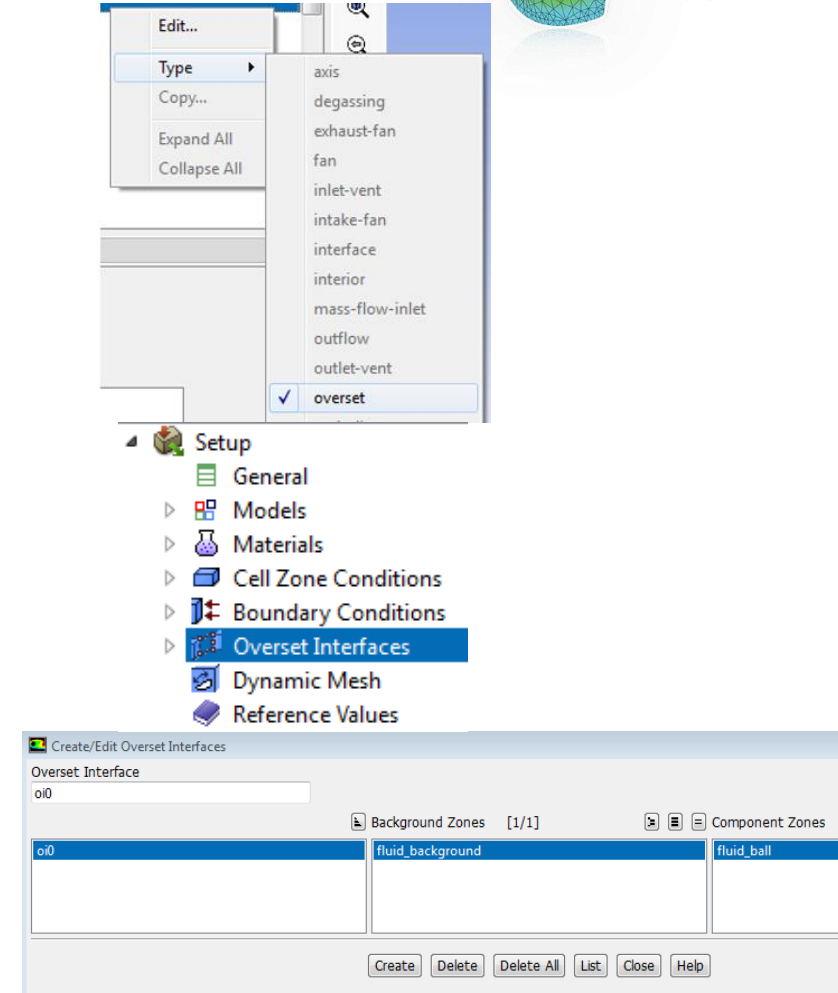
\* Non-conformal interfaces allowed as long as components do not intersect with the non-conformal interface

# Overset Workflow in Fluent

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# Overset mesh setup procedure

- **Read all related meshes into fluent**
  - ✓ Ensure that the “Overset” BC is assigned in meshing
- **Set the overset boundary condition**
  - ✓ Use keyword “overset” in ANSYS Meshing for automatic BC-type assignment
- **Define the overset interface**
  - ✓ Select background and/or component meshes
- **Define grid priorities if needed**
  - ✓ [/define/overset-interfaces/grid-priorities](#)
- **Initialize to intersect the interface**
  - ✓ Or use TUI commands without initialization
  - ✓ [/define/overset-interfaces/options/expert yes](#)
  - ✓ [/define/overset-interfaces/intersect](#)

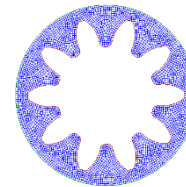


# How to set Overset Mesh

You can set Overset Mesh by 3steps.

**Step1. you change type of BC to overset**

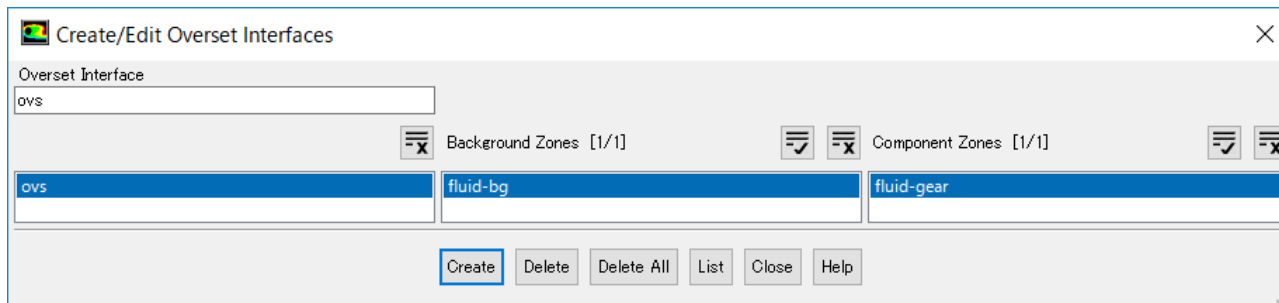
| Phase     | Type      | ID |
|-----------|-----------|----|
| mixture ▼ | overset ▼ | 14 |



In case of gear,  
you may set outer  
circumference as overset

**Step2. you set Overset Interface in following panel**

**You specify Background and Component. (zone type is defined by automatically)**  
**And you create overset interface by “create” button.**



**Step3. initialization**

**When you initialize, Overset Interface is calculated then cell is classified.**

**→ how overset interface is made??**



# Check after initialization



If you encounter problems after initialization. . .

## Case-1 : failure in hole cutting

→ It occurs when dead cell is not detected well

→ You may fix it by adjusting boundary or cell size.

## Case-2 : detection of orphan cells

→ When receptor can't find donor, orphan cell occurs.

→ You may fix it by adjusting overlapping area or cell size.

By default the solver applies a numerical treatment that attempts to assign reasonable values to the orphan cells.

Calculation will be diverged as the case may be.  
in that case, You have to modify mesh.

In both cases, workaround is “modify mesh”.  
(sometimes problem may be solved by change of priority)

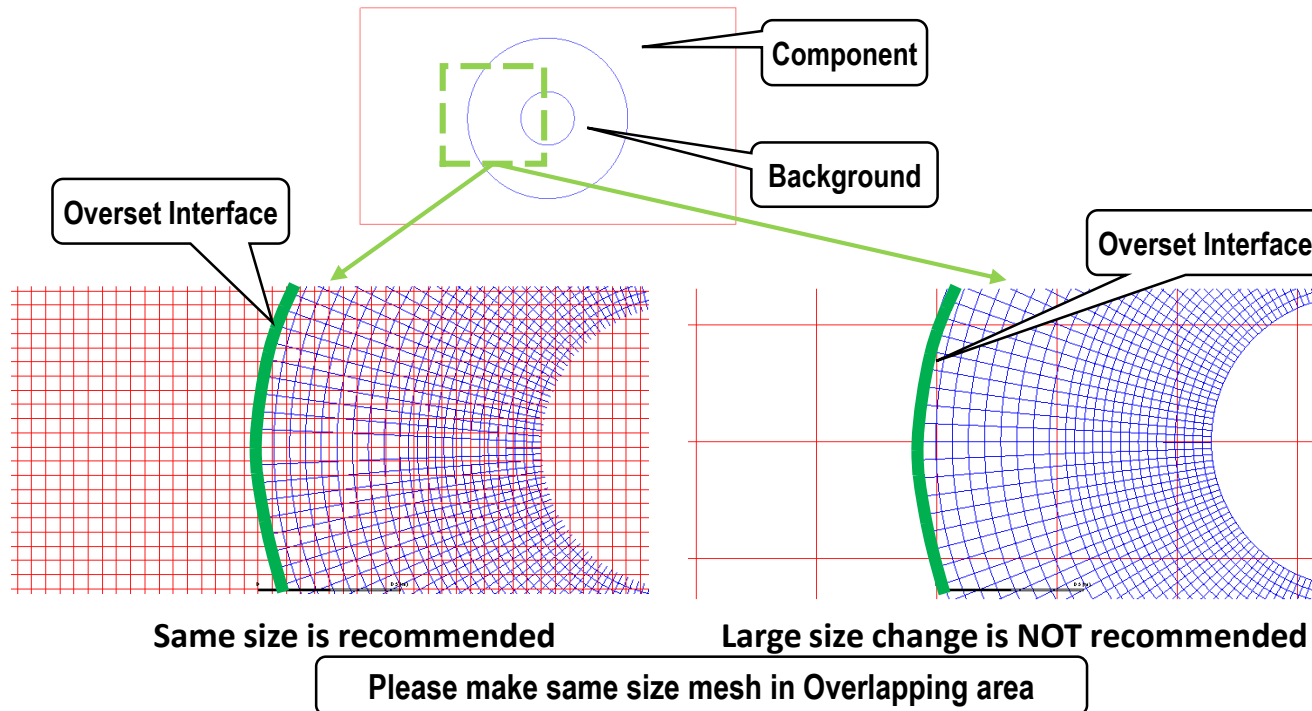
# Challenges & Tips

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# Mesh size in overlapping area



Please pay attentions to mesh size when you use overset mesh, to prevent a kind of occurrence of orphan, large error, etc.



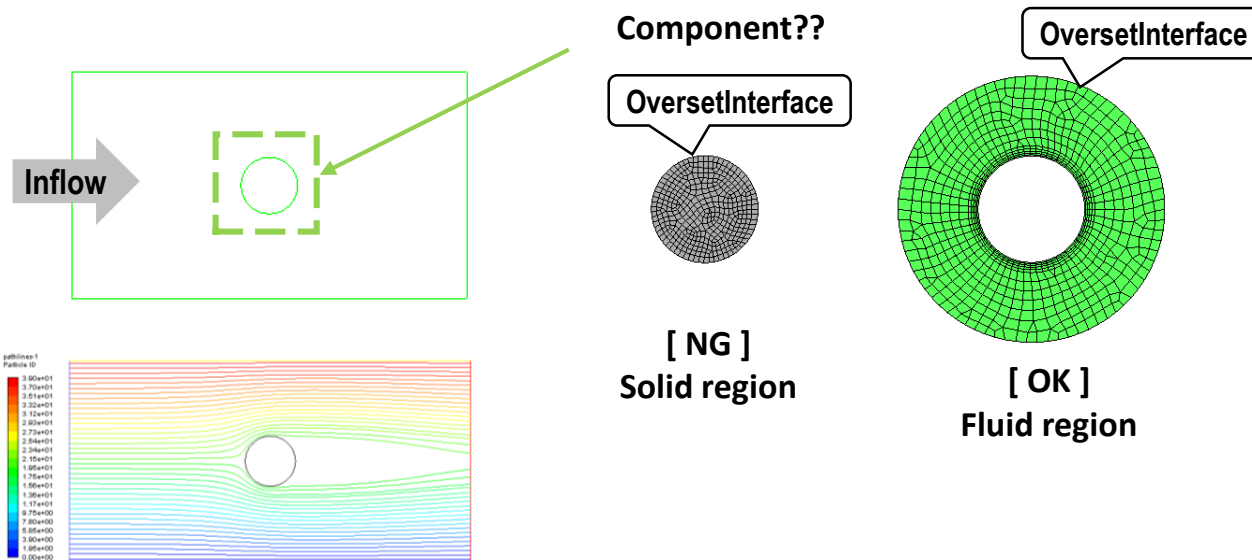
# Treatment of solid-1



Overset Interface can't set to solid / fluid interface.

When you want to calculate external flow of cylinder,  
solid region can't be component.

Fluid region around cylinder can be used as component mesh.

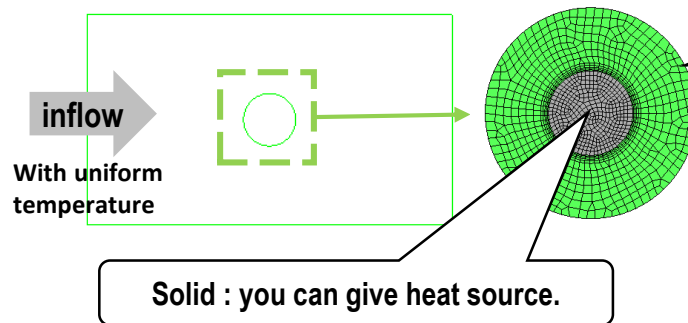


# Treatment of solid-2



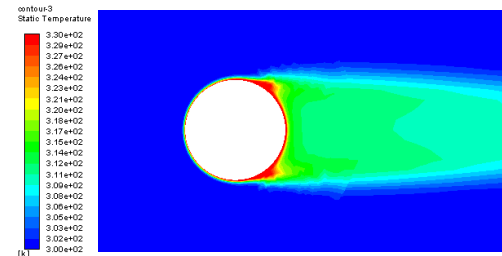
Caution !

You can calculate with solid region, if you set overset interface in fluid region.



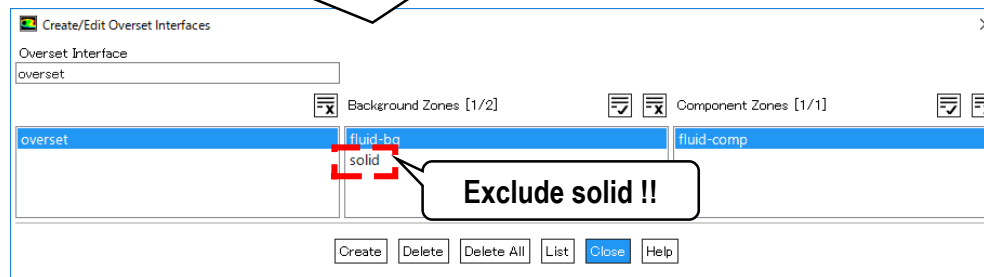
Overset Interface is set to outer circumference of fluid zone

Heat transfer form solid can be calculated



Temperature in fluid

Overset interface should be set only fluid zone





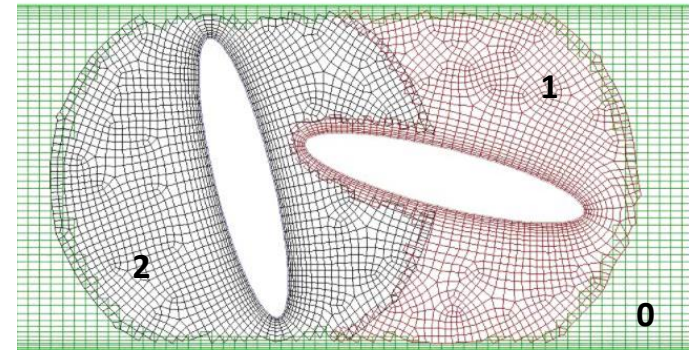
# Overlap Minimization – Cell Donor & Grid Priorities

## ■ Selecting cell donor priority method

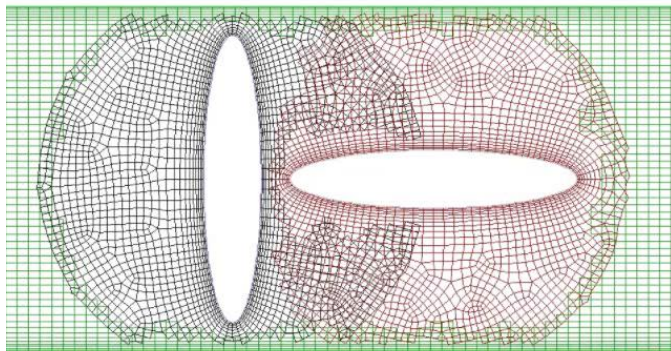
- ✓ `/define/overset-interfaces/options/donor-priority-method`
  - 0: Cell Volume Based (default)
  - 1: Boundary Distance Based

## ■ Assigning grid priorities for component and background grids (optional)

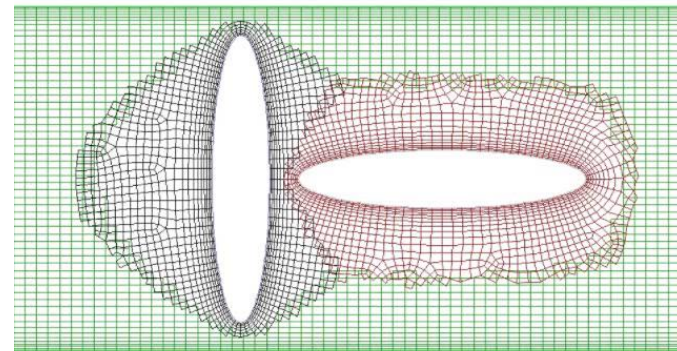
- ✓ `/define/overset-interfaces/grid-priorities`
- ✓ Grid priority overrides cell donor priority



Grid priorities



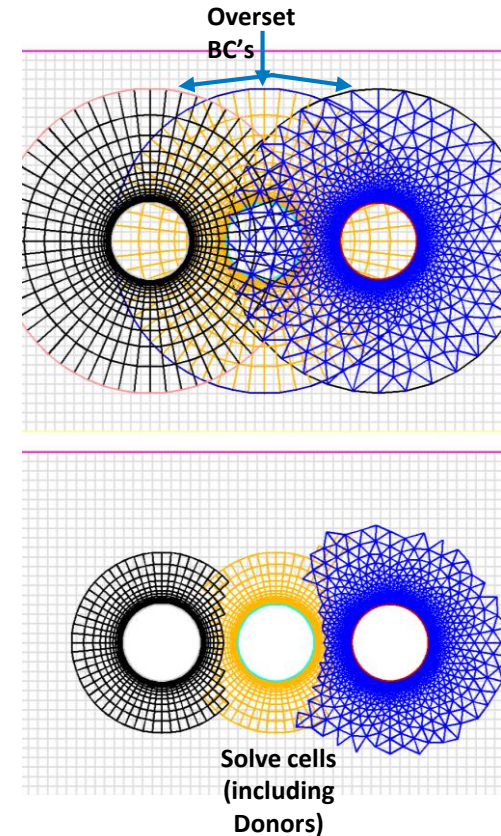
Cell size based donor  
priority



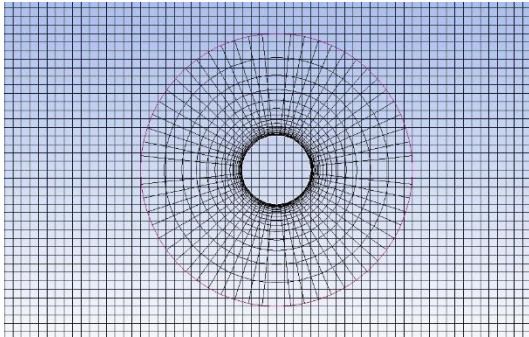
Boundary distance based donor  
priority

# Overset mesh topologies

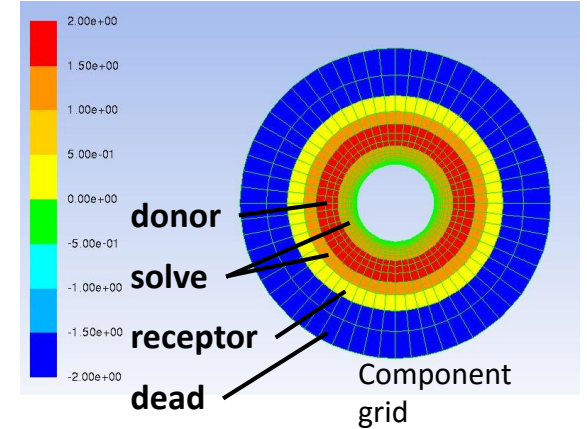
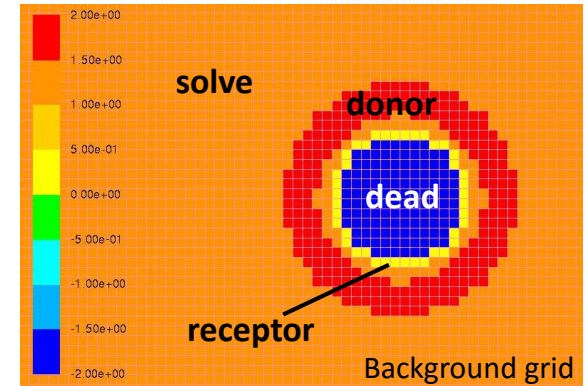
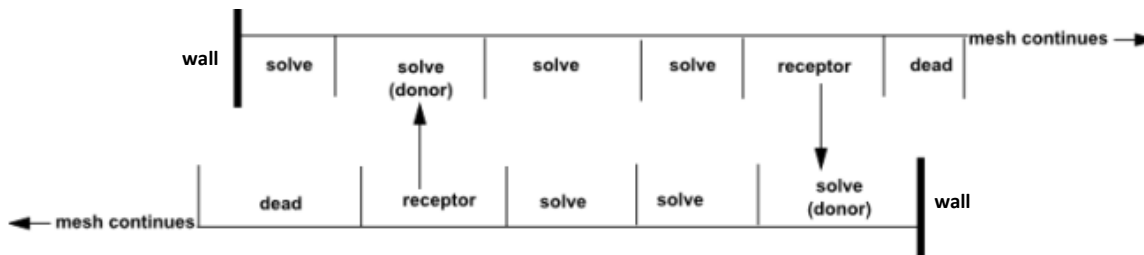
- There is no limit to the number of cell zones that can participate in an **overset interface**
  - **Background** zones:
    - ✓ Without **overset BC**
    - ✓ Must be **conformal** to other background zones
    - ✓ Can have non-conformal interfaces to zones that are not included in the **overset interface**
  - **Component** zones:
    - ✓ If background zones present, must **overlay** background zones
    - ✓ A mesh can be build with only component zones
    - ✓ Need an **overset BC** to connect to other component / background zones
    - ✓ Cannot be part of a non-conformal interface
    - ✓ Can have nested cell zones
- **All cell types** supported by Fluent are supported with **overset mesh**
- Compatible with **mesh adaption**



# Domain Connectivity



| Cell Type | Integer Function Value |
|-----------|------------------------|
| Donor     | 2                      |
| Solve     | 1                      |
| Receptor  | 0                      |
| Orphan    | -1                     |
| Dead      | -2                     |



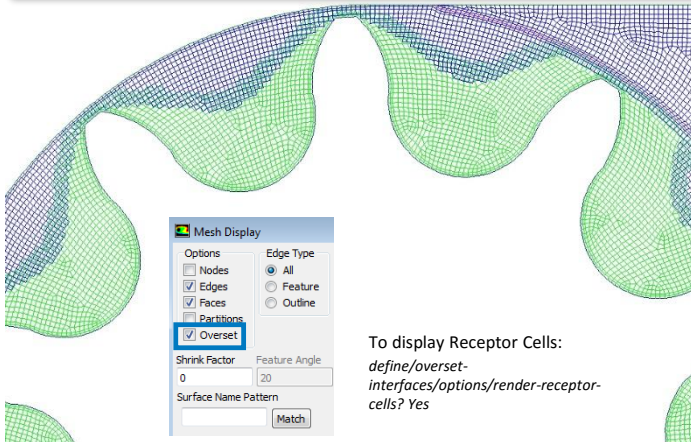


# Domain Connectivity

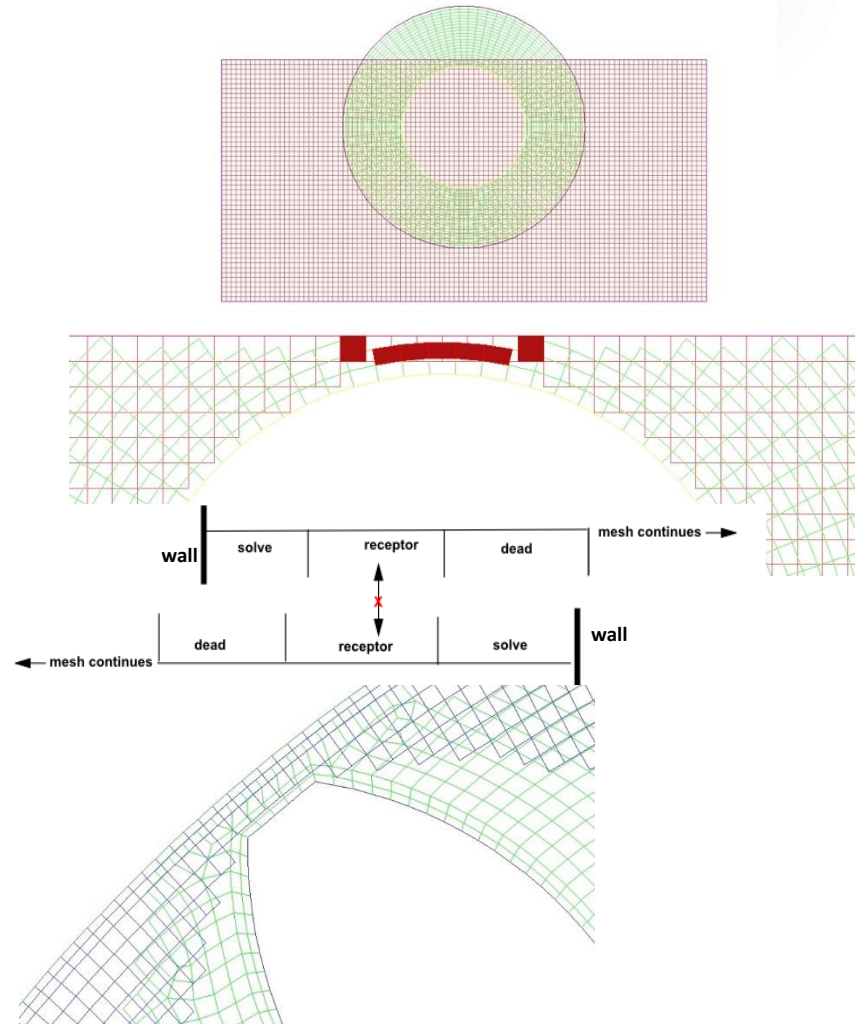
- Sufficient overlap required in order to prevent orphan cells
  - ✓ Issue when boundaries are in proximity
  - ✓ Minimum of 4 cells in each overlapping mesh to avoid orphan cells

```
Updating overset interface o-if.
```

```
WARNING: 1 overset orphan cells in interface o-if.
```



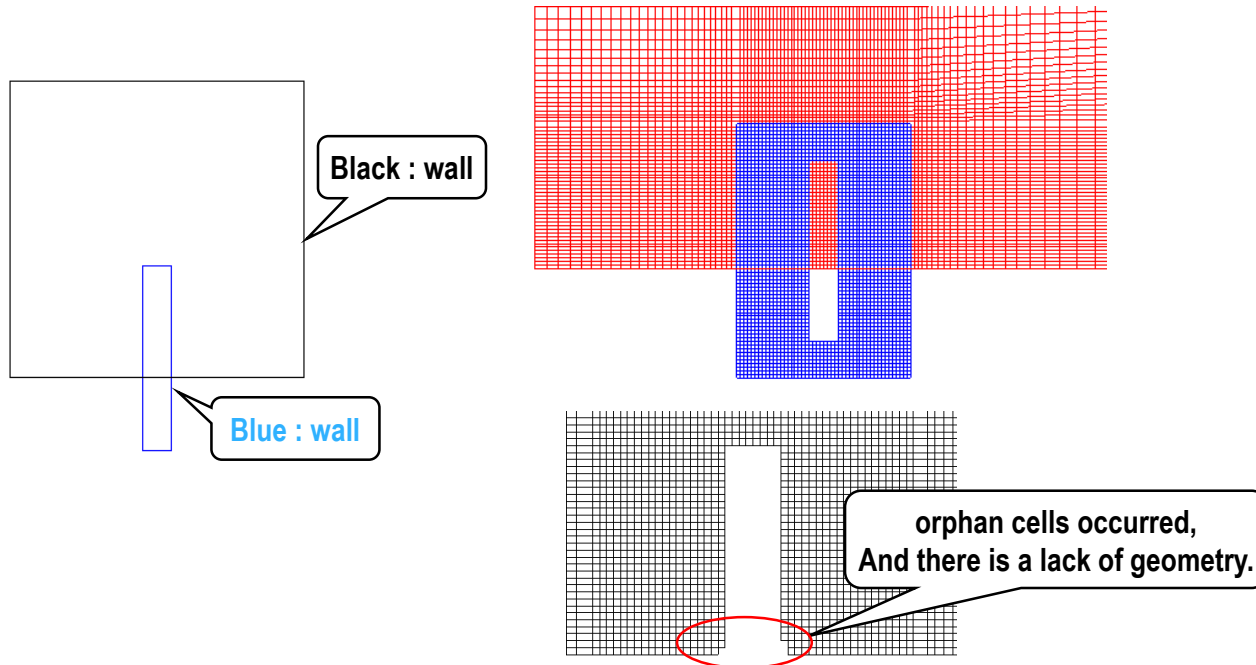
To display Receptor Cells:  
`define/overset-`  
`interfaces/options/render-receptor-`  
`cells? Yes`



# Wall intersection is NG

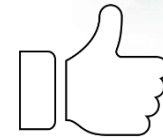


Wall intersections makes orphan cells,  
so intersection is not recommended.





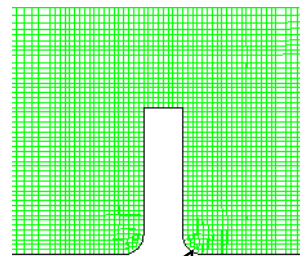
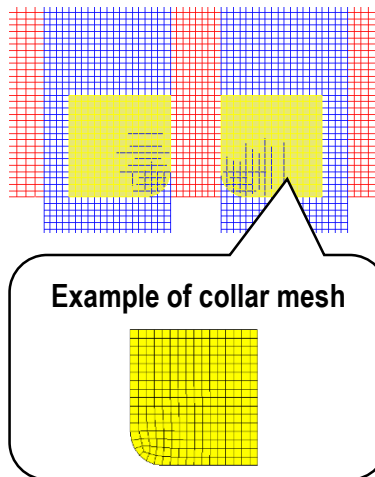
# Tangential wall is OK-1



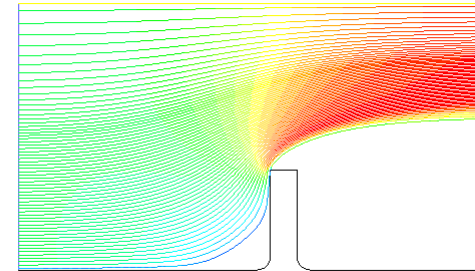
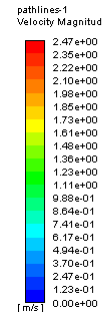
OK

You can calculate with tangential walls→

→ If there is wall intersection, adding tangential component (called collar mesh) will make it possible to calculate.



Each walls can be connected continuously



No orphan cells

```
> def over mark orphan n
```

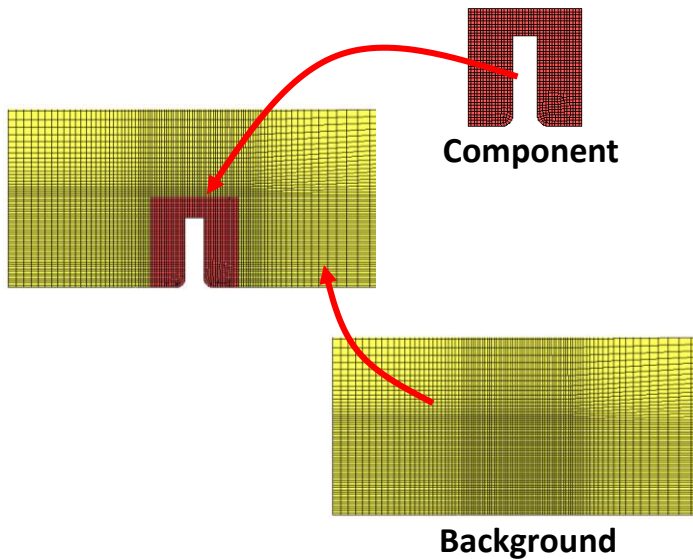
```
Marked 0 orphan cells in register overset-orphan-cells-r1.
```

Caution :  
Only for single side wall  
Not coupled wall

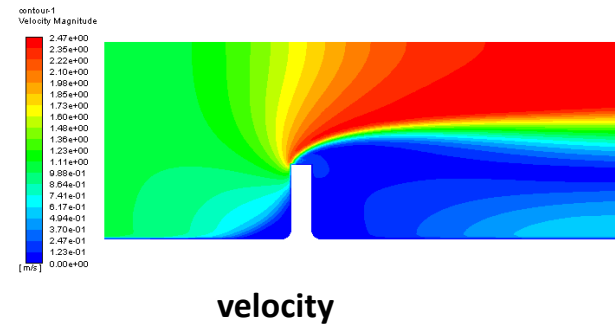
# Tangential wall is OK-2



A mesh may be created in advance as a contacting shape



You can calculate with no problems



No orphan cells

```
> def over mark orphan n
```

```
Marked 0 orphan cells in register overset-orphan-cells-r1.
```

# Fluent Overset Interface tips & Solver tips



- Too keep the component walls away from mesh overlap region set donor-priority-method to “boundary-distance-based”
- Keep the Courant number for coupled solver to “200” to help with faster convergence
- Displaying contours of “Overset Cell Type” works well for 2D cases. In 3D cases, marking and displaying the cells is useful for locating the orphan cells.
- Try anisotropic mesh adaption on walls for removing orphans in small contact regions

In order to use Overset mesh well. . .

- It's recommended to adjust Receptor and donor cell sizes comparable.
- It's recommended to start transient simulations from a converged steady-state solution.
- If you are experiencing startup issues with a steady-state case, it is recommended that you ramp-up to the final boundary conditions.
- When using automatic timestep calculation for the pseudo-transient method, it is recommended that you use the user-defined length scale option.
- If you replace a zone, you should either reinitialize the solution or patch the solution before continuing with the calculation.
- It is recommended that you use the double-precision solver.
- For dynamic and sliding mesh cases,
  - (1) The ideal time step size should be chosen such that the relative mesh motion does not exceed the length of the smallest cell.
  - (2) Do not have large variations in mesh resolution in the motion path.

# Running transient cases



- When using moving meshes, start with a time step size equivalent to moving the smallest cell (in the overset interface) one cell length per time step

✓ If the time step is too large, dead cells will directly turn into solve cells without first being a receptor. This information is printed in the TUI (at verbosity >0):

```
Updating solution at time level N... done.
```

```
Updating overset interface o-if.
```

```
WARNING: 951 overset dead->solve cells in interface o-if.
```

| iter | continuity | x-velocity | y-velocity | z-velocity | k          | epsilon    | surf-mon-1 | surf-mon-2 | time/iter  |
|------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 240  | 4.6721e-03 | 3.6292e-05 | 5.0243e-05 | 3.3826e-05 | 8.3157e-04 | 6.9187e-04 | 1.1554e+01 | 1.2119e+01 | 0:00:39 10 |
| 241  | 1.9478e-01 | 1.3629e-03 | 1.4206e-03 | 1.3155e-03 | 1.2627e+00 | 3.7917e+00 | 1.2844e+01 | 1.3364e+01 | 0:00:32 9  |
| 242  | 9.1586e-02 | 8.3932e-04 | 9.6232e-04 | 7.8482e-04 | 6.7096e-02 | 5.7639e-02 | 1.2908e+01 | 1.3428e+01 | 0:00:27 8  |
| 243  | 4.4753e-02 | 4.0263e-04 | 4.3435e-04 | 3.8380e-04 | 3.9938e-03 | 2.1586e-03 | 1.2532e+01 | 1.3072e+01 | 0:00:25 7  |
| 244  | 2.4027e-02 | 2.7077e-04 | 2.8110e-04 | 2.5905e-04 | 1.0110e-03 | 1.6787e-03 | 1.2196e+01 | 1.2749e+01 | 0:00:22 6  |
| 245  | 1.7354e-02 | 1.9456e-04 | 2.0549e-04 | 1.7716e-04 | 8.8818e-04 | 1.4884e-03 | 1.2000e+01 | 1.2561e+01 | 0:00:18 5  |

- Important to track any creation of orphan cells during mesh motion

✓ Save the transcript and look out for orphans

```
Updating solution at time level N... done.
```

```
Updating overset interface o-if.
```

```
WARNING: 1 overset orphan cells in interface o-if.
```

```
WARNING: 863 overset dead->solve cells in interface o-if.
```

| iter | continuity | x-velocity | y-velocity | z-velocity | k          | epsilon    | surf-mon-1 | surf-mon-2 | time/iter  |
|------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 960  | 2.0771e-04 | 1.9173e-06 | 4.9007e-06 | 2.1088e-06 | 1.9535e-04 | 1.3638e-04 | 1.1476e+01 | 1.2025e+01 | 0:00:32 10 |

✓ Check that the solution looks reasonable



# Examples

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# HiLift NHLP2D case

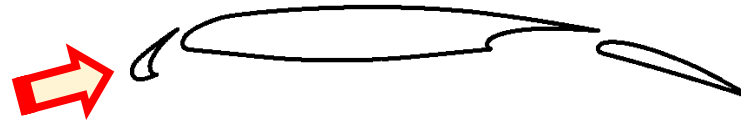
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# Mesh & Setup

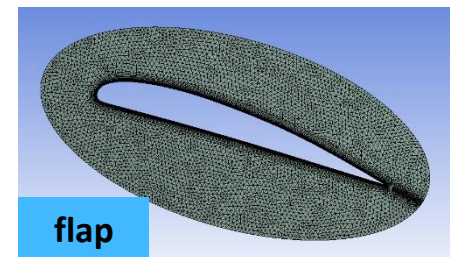
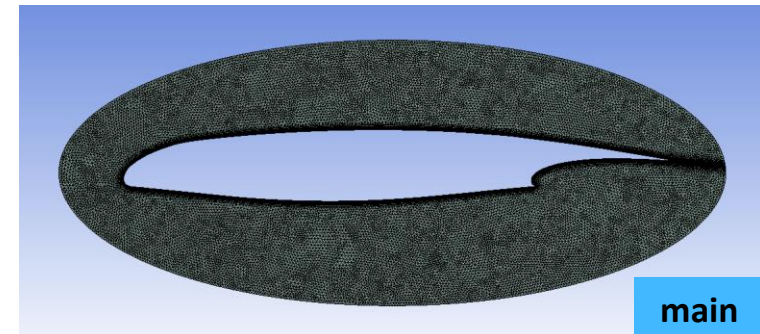
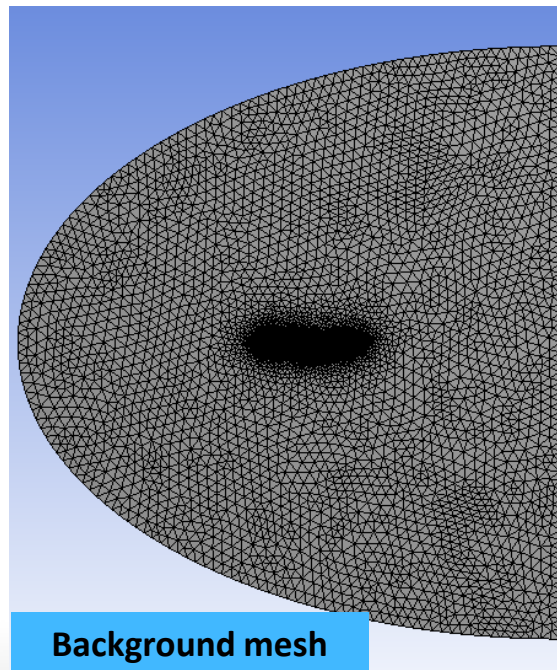
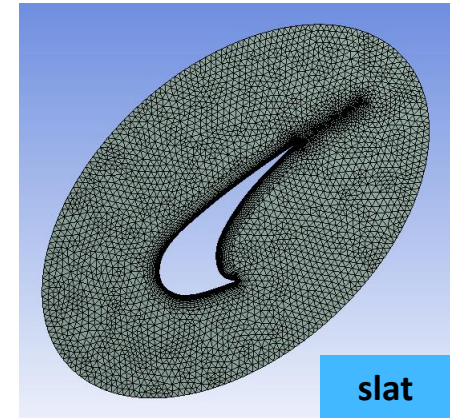
## Conditions:

- $MAC = 1m$
- $aoa = 20.18^\circ$
- $M_\infty = 0.197$
- $T_\infty = 300\text{ K}$
- $Re_{MAC} = 3.52 \times 10^6$

PBNS, SST k- $\omega$

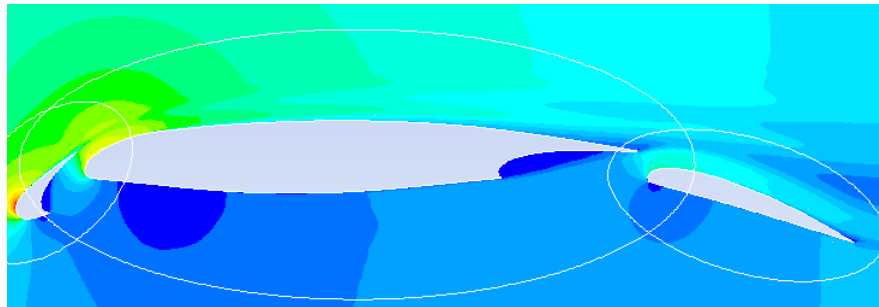
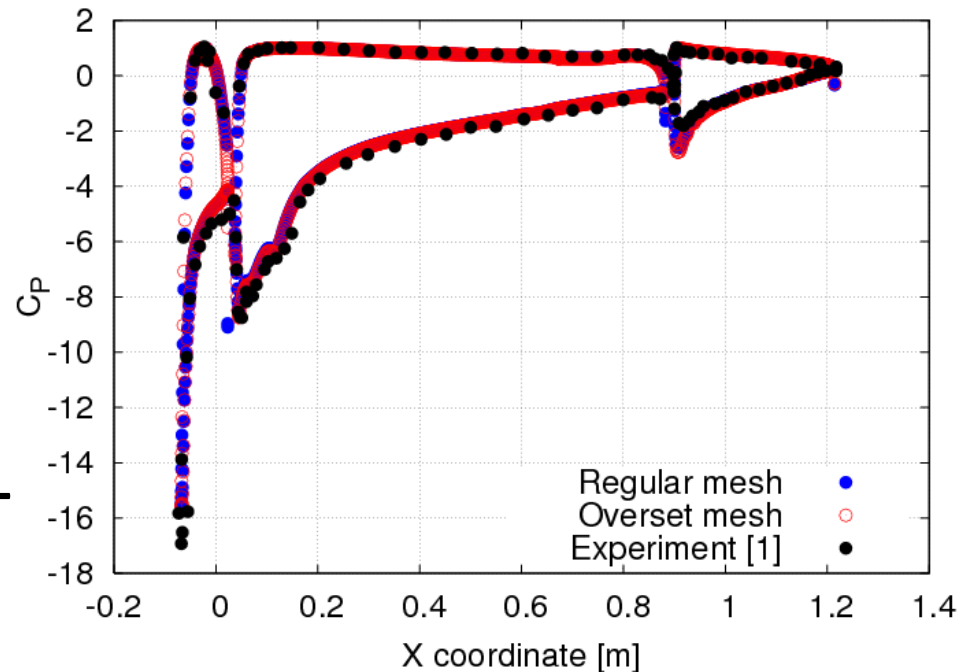


High Lift configuration

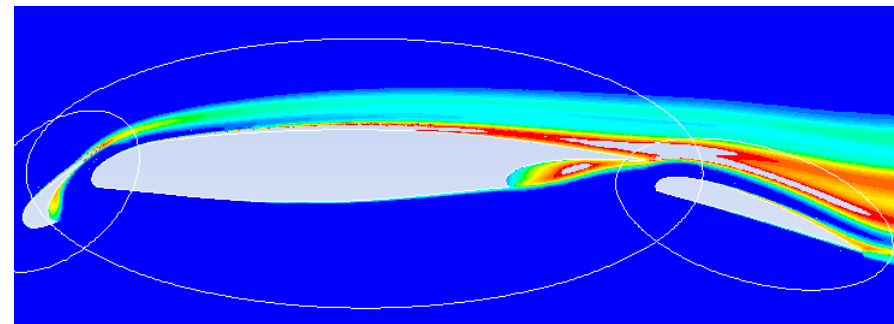


# Results

- Almost similar results with Regular and Overset meshes (Mesh count is similar ~300K)
- This simulation should be performed with Transition SST
- Overset is not compatible yet with Transition SST, R18



Mach Contours



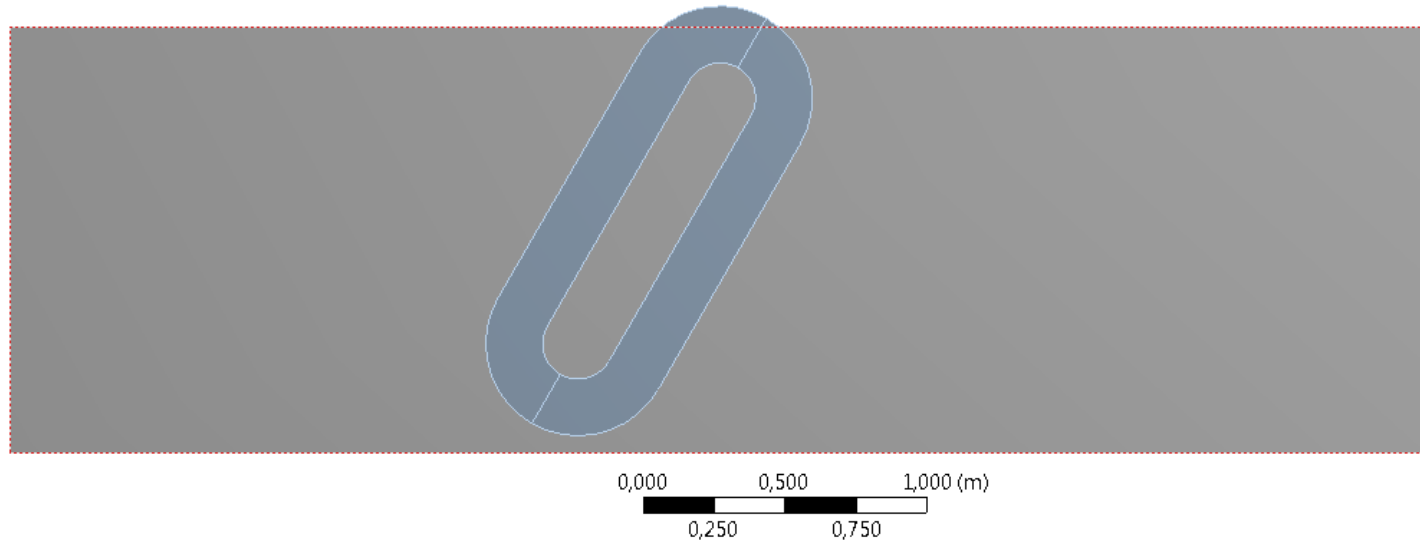
Turbulence Intensity

# Pendulum Simulation

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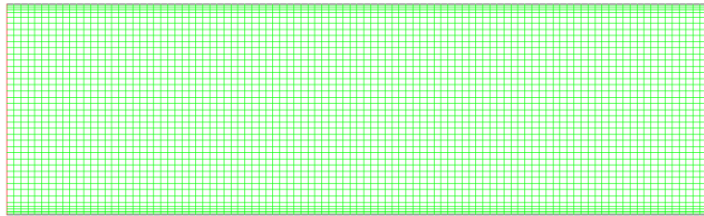


# Geometry

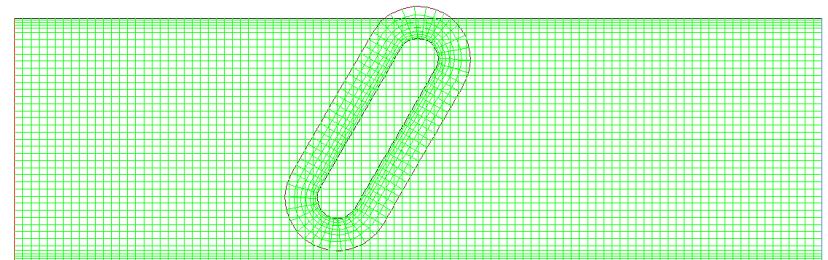
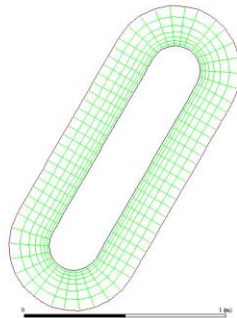


The geometry of the flap consists of a 2D channel with a flap inside. The flap is rotated around the origin for 30 degrees clockwise. Note that the origin is the point of rotation but it is not the center of gravity for the flap.

# Mesh Generation



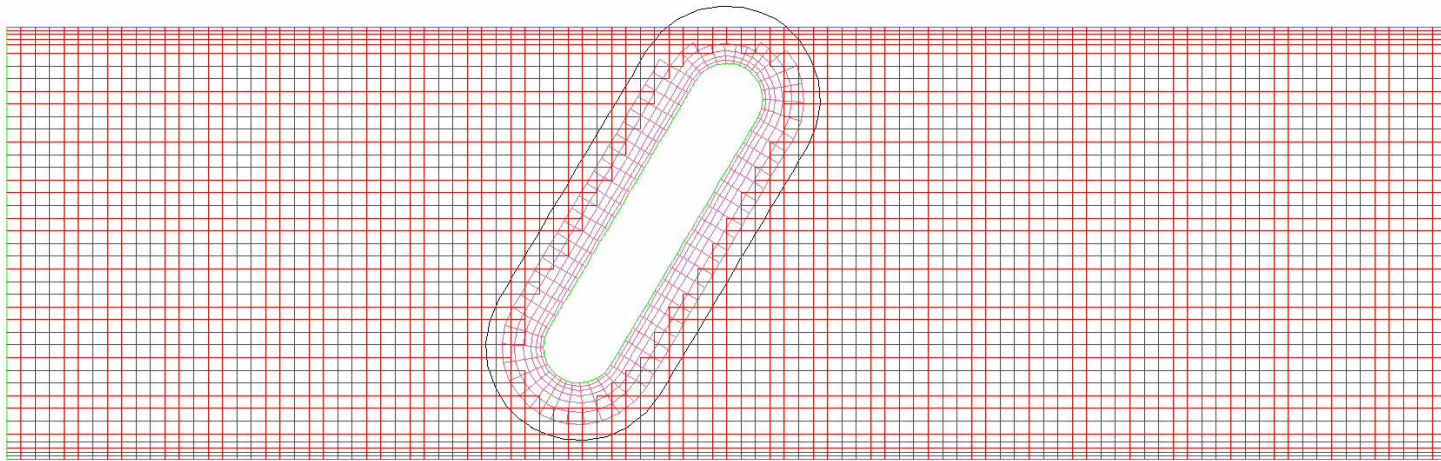
0 1 (m)



0 1 (m)

# Overset Results

## Mesh-motion



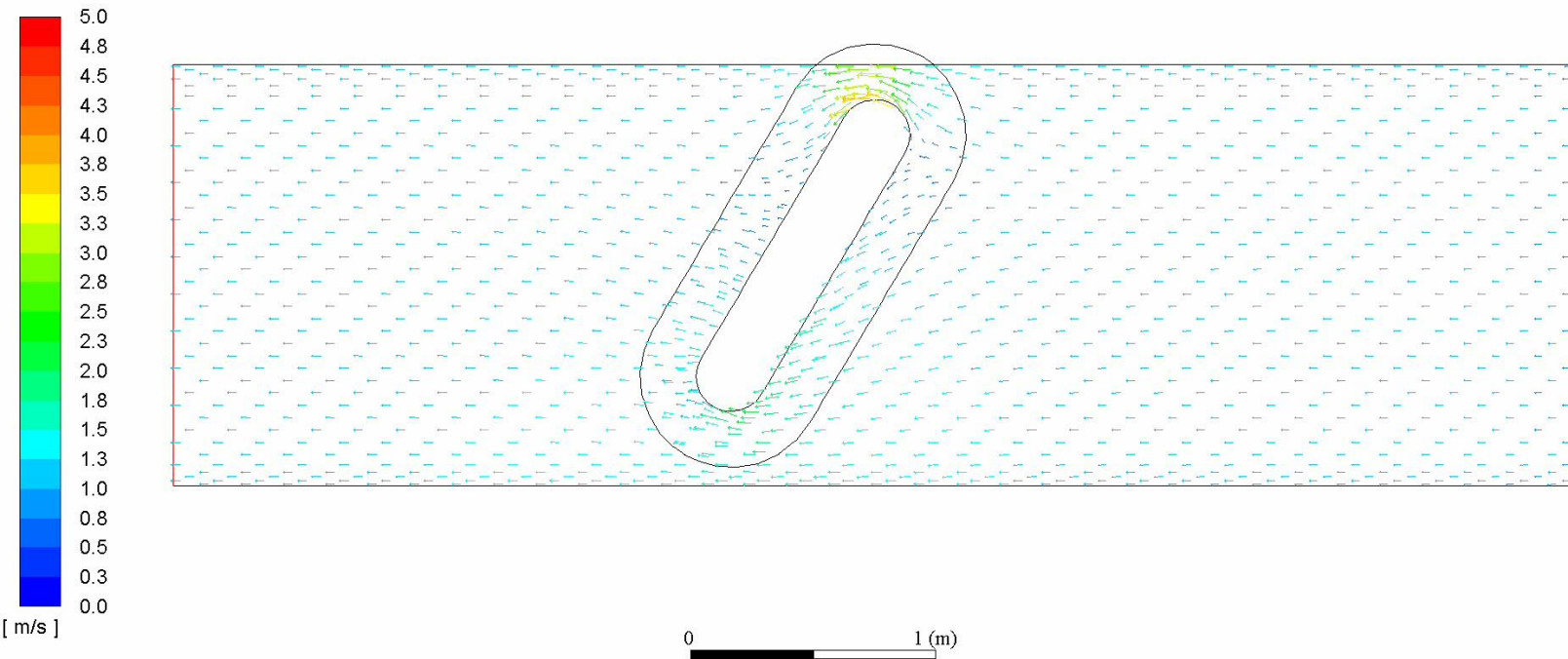
0 1 (m)

mesh-1 (Time=1.0000e-02)

# Overset Results

## Mesh-motion

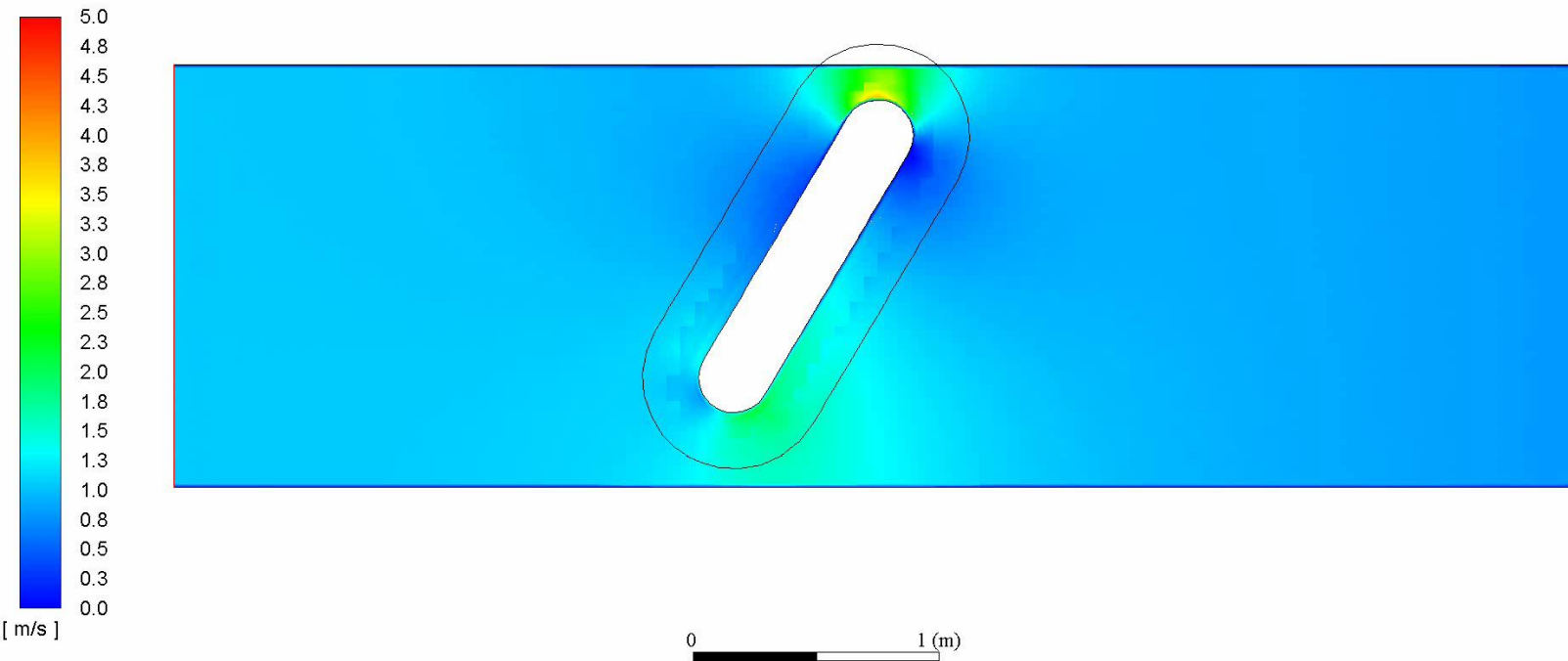
velocity-vectors  
Velocity Magnitude



Velocity Vectors Colored By Velocity Magnitude (m/s) (Time=1.0000e-02)

# Overset Results

velocity-contour  
Velocity Magnitude



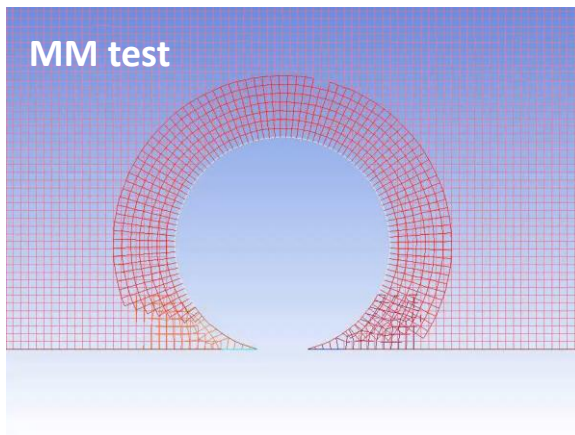
Contours of Velocity Magnitude (m/s) (Time=1.0000e-02)



# Tire and Ground Contact Modeling

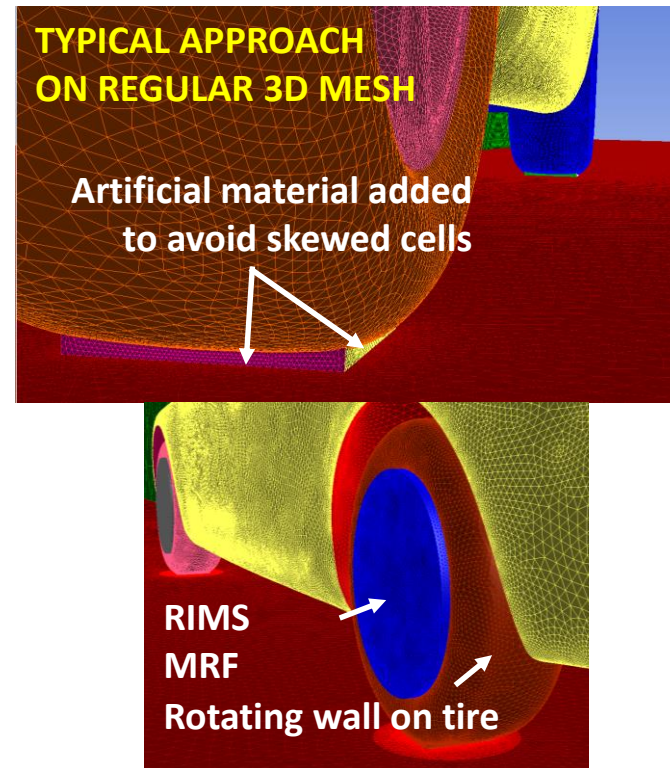
---

# Motivation

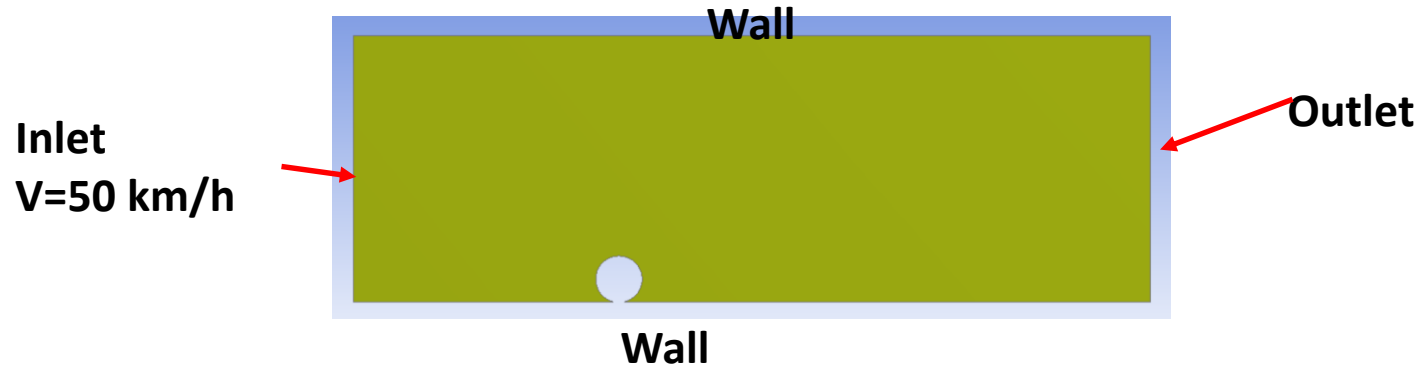


In auto external aero:

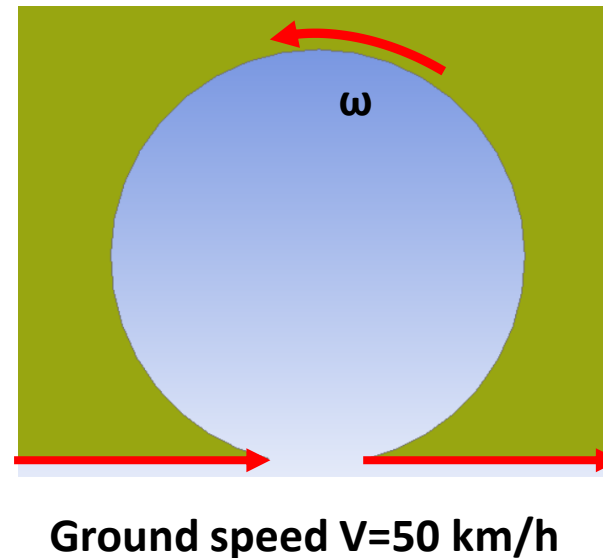
- Rotating wall on the tire
- MRF/MM on wheel/rim to capture axial swirl flow in 3D



# Problem Description 2D



- R tire = 0.35m
- $\omega = V/R = 13.88/0.35 = 39.68$  rad/s
- Tire-ground penetration = 10 mm
- Wheel/rim should be modeled in 3D with MRF/SM
- Air, constant density

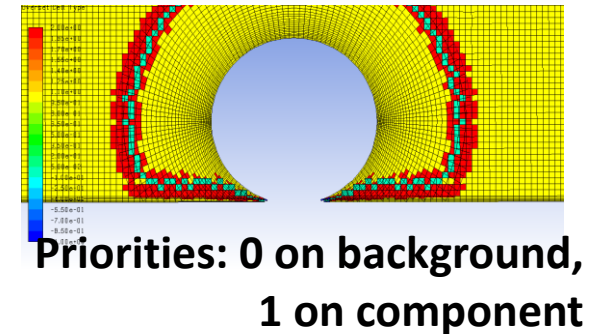
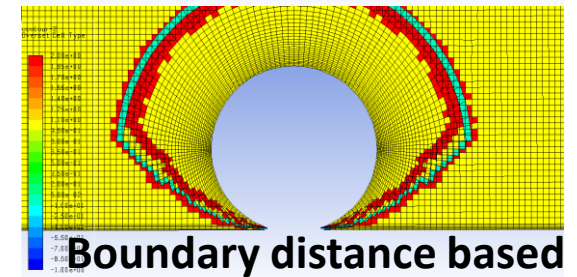
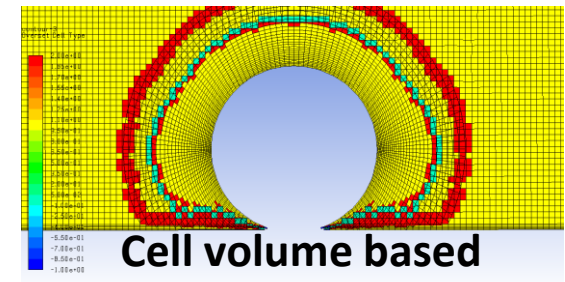
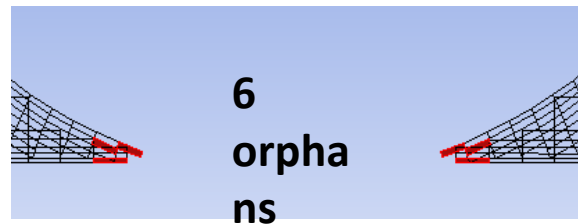
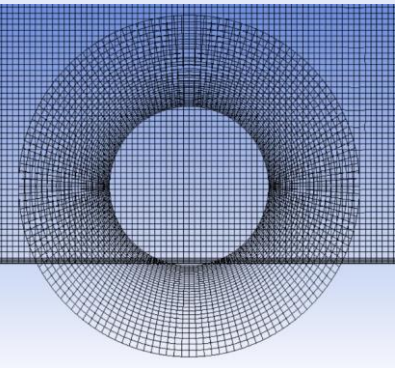
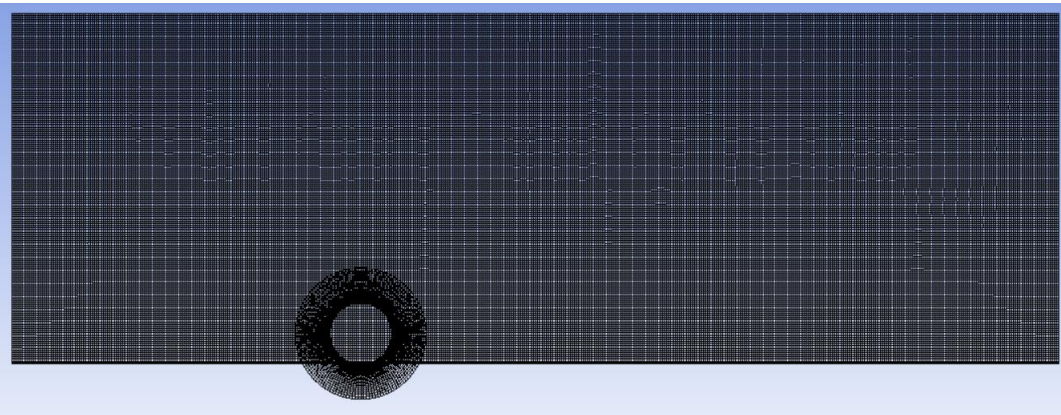


# Overset Mesh (without collar grids)

AM mesh

82920 quad cells

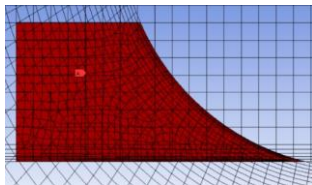
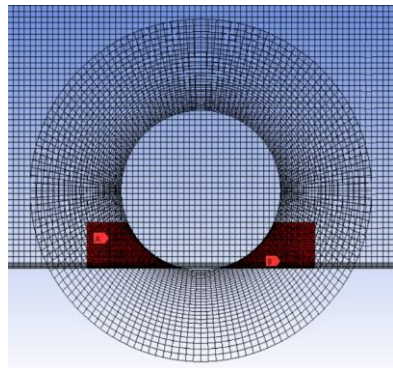
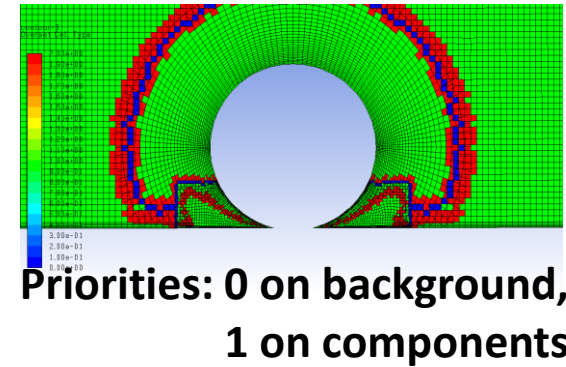
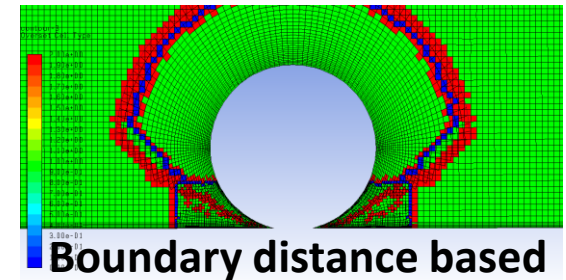
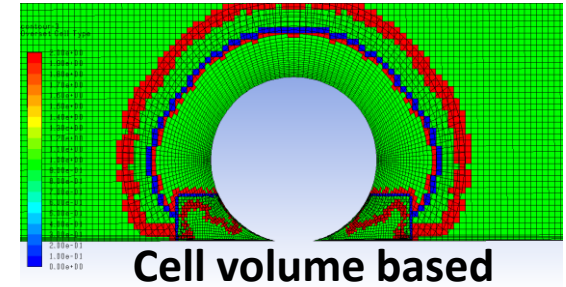
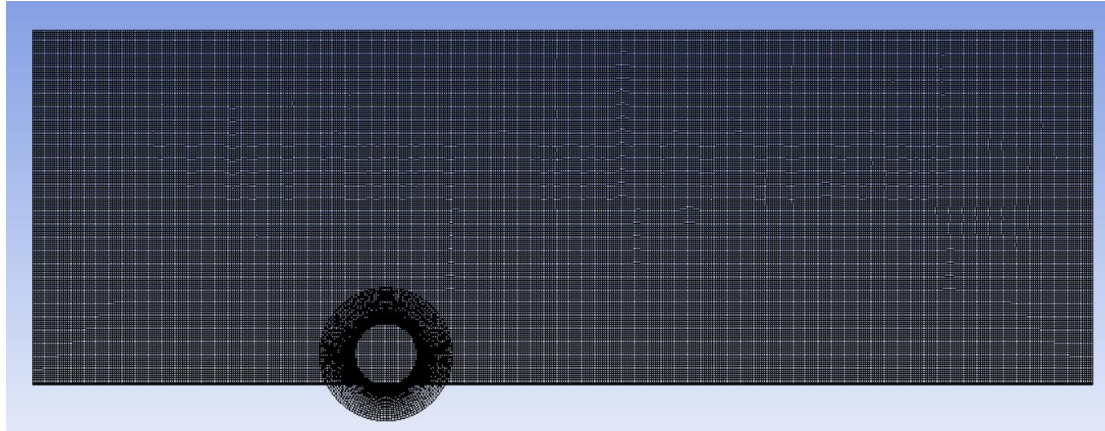
Max skewness 0.286





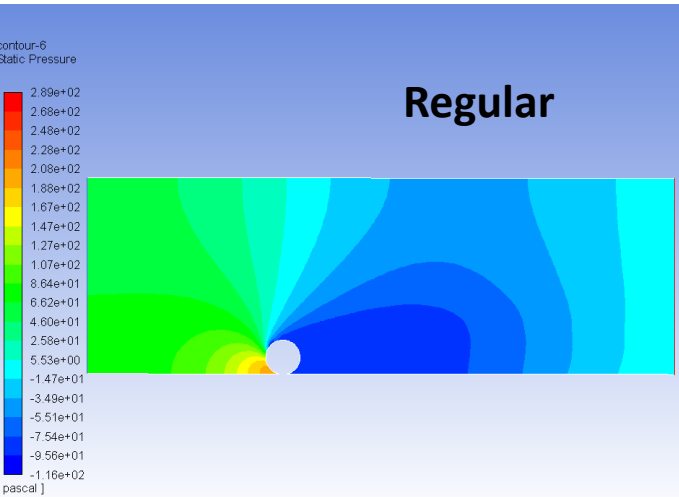
# Overset Mesh (with collar grids)

AM mesh; 84703 quad cells;  
Max skewness 0.932

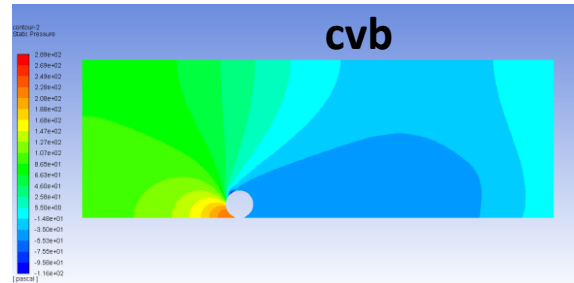




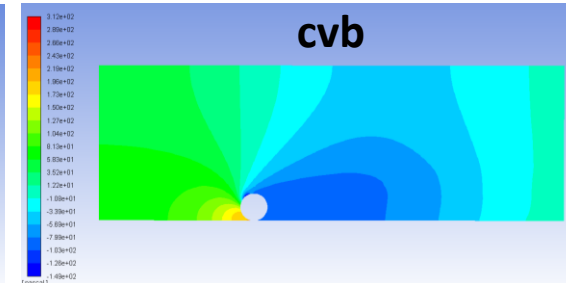
# Pressure contours



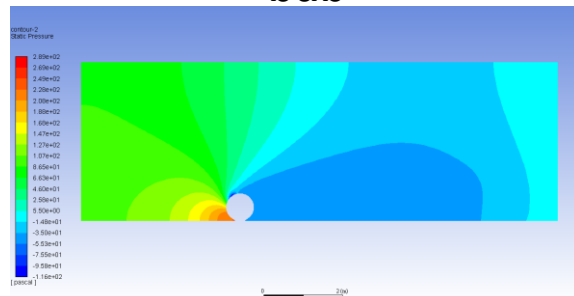
**Without collar grids**



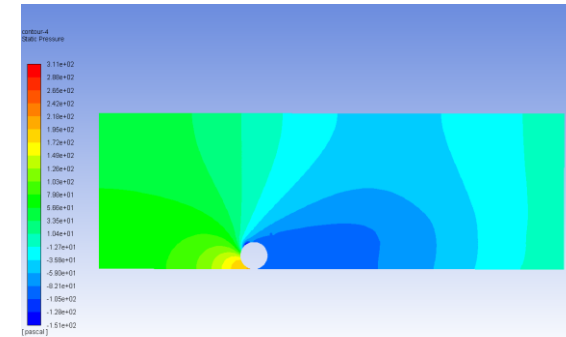
**With collar grids**



**bdb**

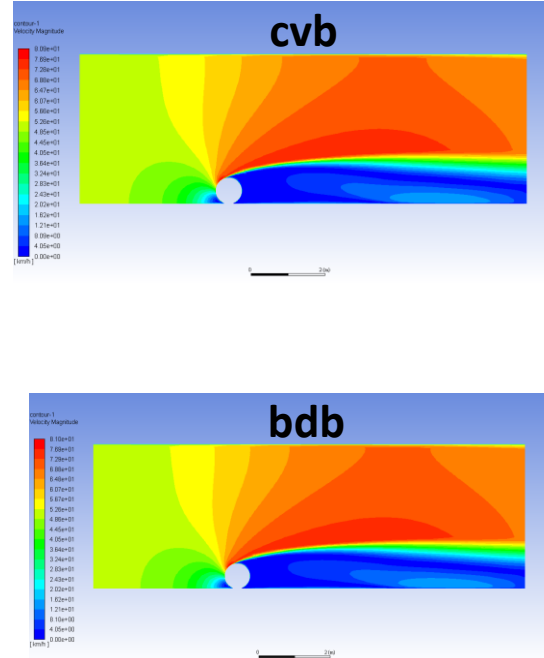
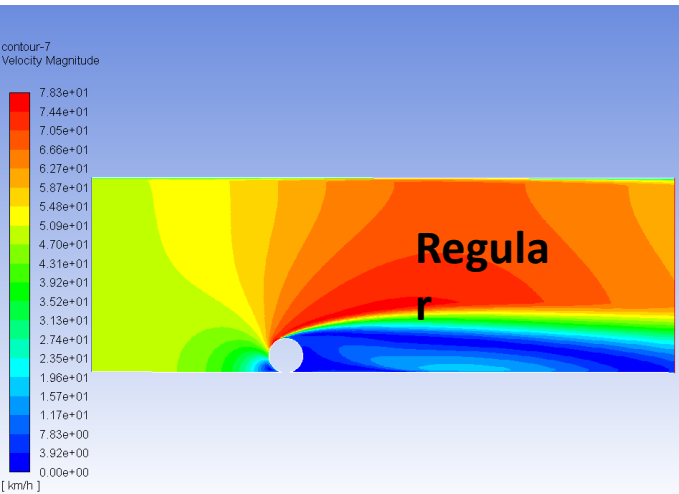


**bdb**

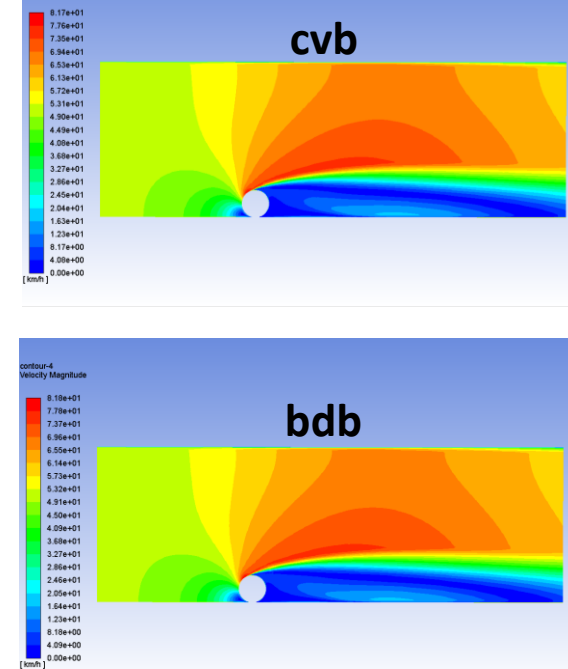


# Velocity contours

## Without collar grids



## With collar grids

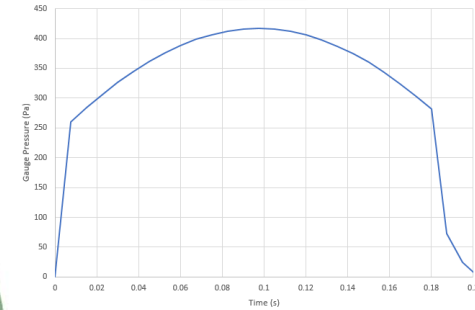
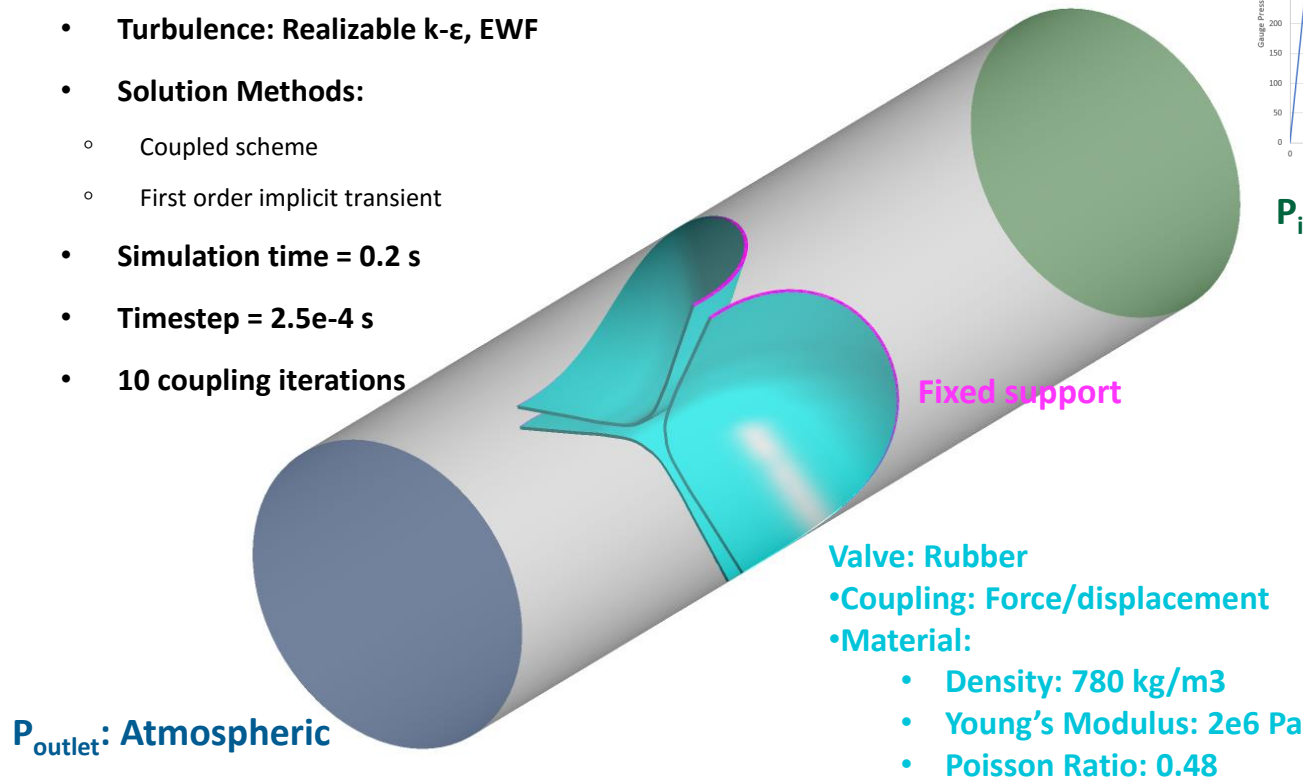


# Heart Valve FSI

---

# Setup

- **Fluid Material: Compressible water**
- **Turbulence: Realizable k- $\epsilon$ , EWF**
- **Solution Methods:**
  - Coupled scheme
  - First order implicit transient
- **Simulation time = 0.2 s**
- **Timestep = 2.5e-4 s**
- **10 coupling iterations**

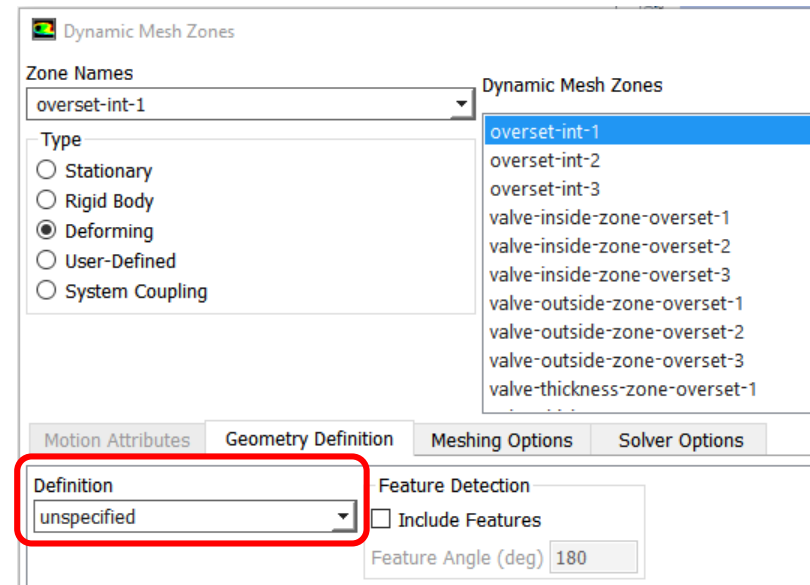


**P<sub>inlet</sub>: Profile**

# Overset/Dynamic Mesh settings

- Smoothing: Linearly Elastic Solid
- Dynamic Mesh: Overset interface geometry definition = unspecified

These settings are required in order to have the overset interface follow the deforming flaps



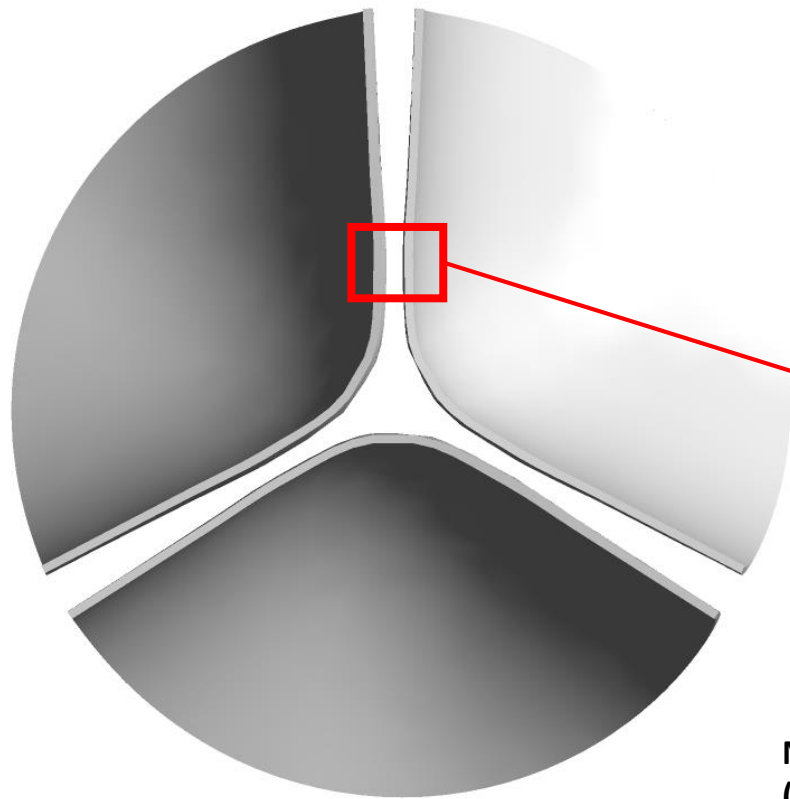


# Overset settings



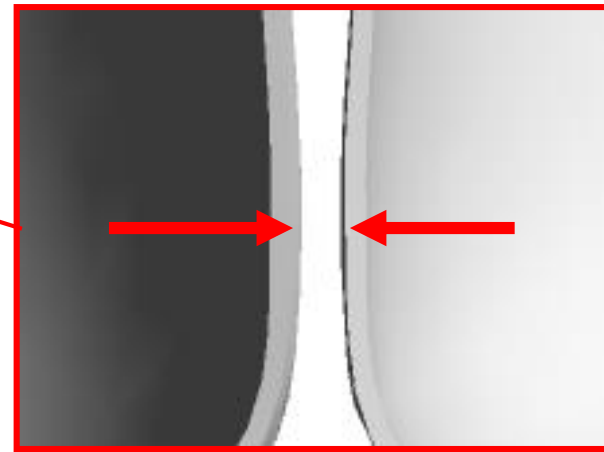
- **Set grid-priority for components to “1”**
  - ✓ This sets the mesh overlap away from the flaps
- **Set “donor-priority-method” to “boundary-distance-based”**
  - ✓ This keeps the mesh overlap between the components in the center between the two flaps during contact

# Contact Definition



**Initial Gap = 0.4 mm**

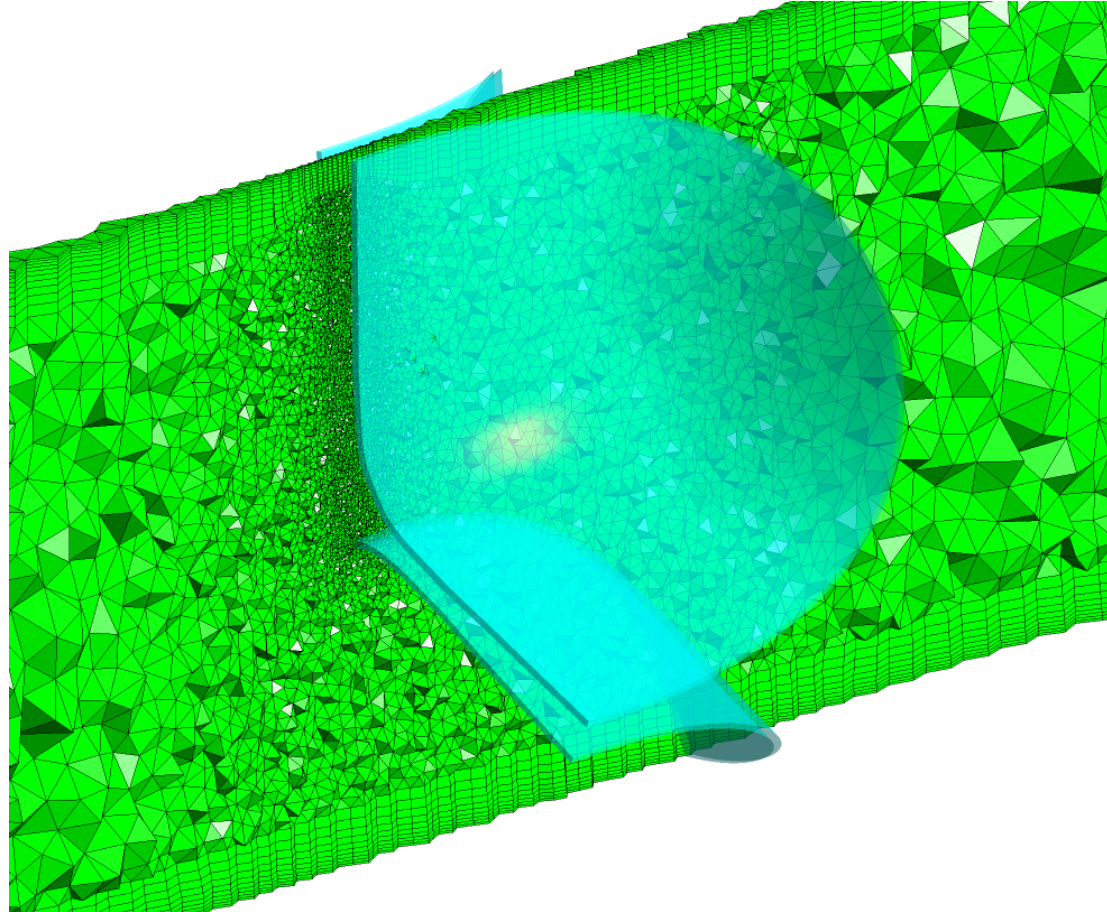
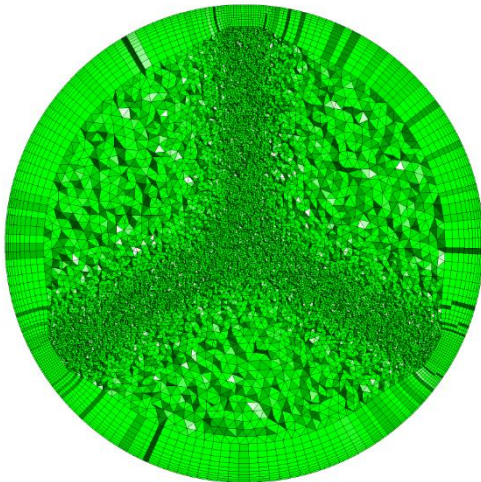
**Contact offset (in Mechanical) = 0.25 mm**



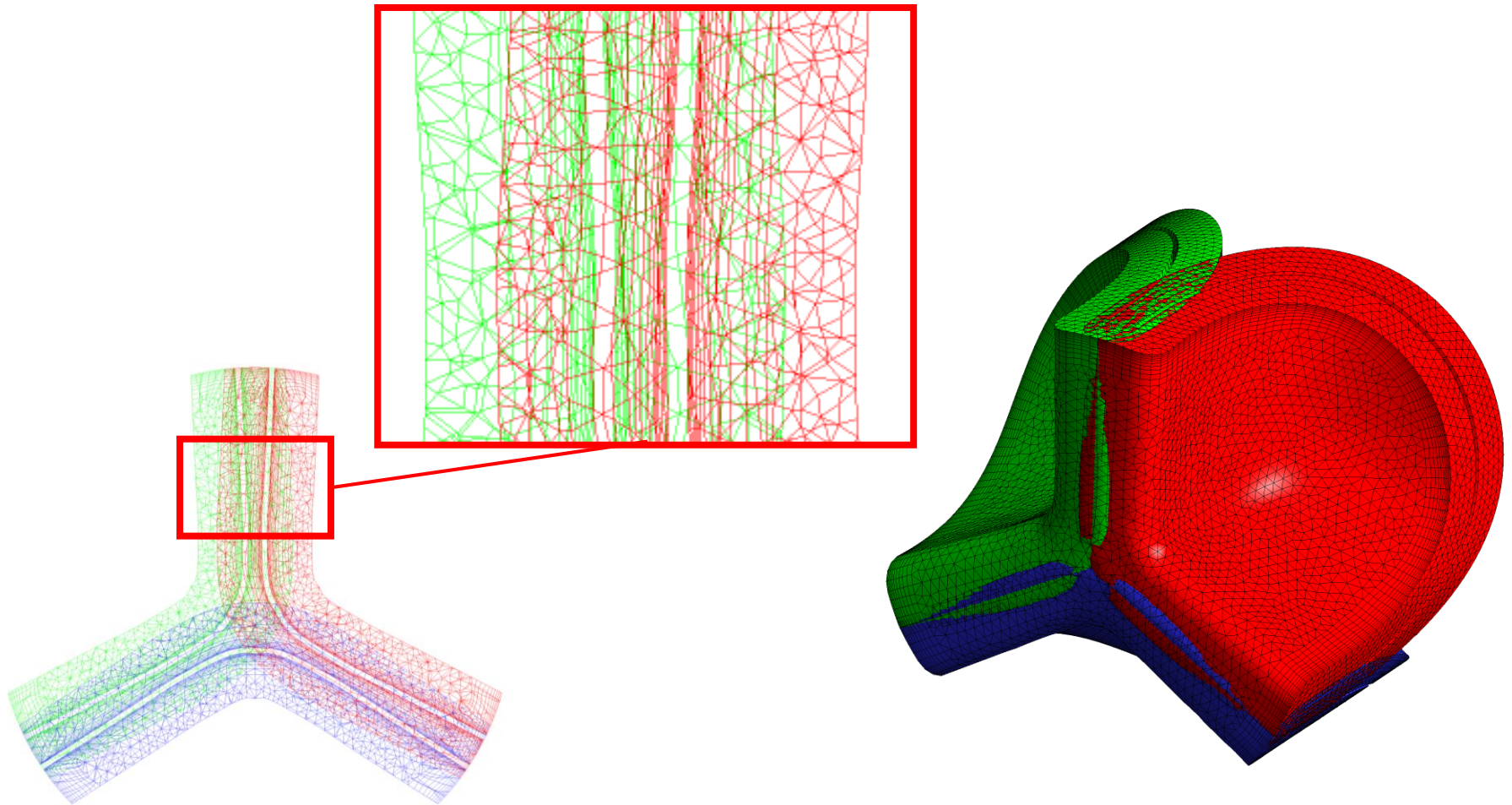
**No Contact Detection/Flow Control in Fluent  
(not compatible with overset)**

# CFD Mesh

- 2,410,972 elements
- Tetrahedron + 10 Inflation layers
- Background mesh refined in gap



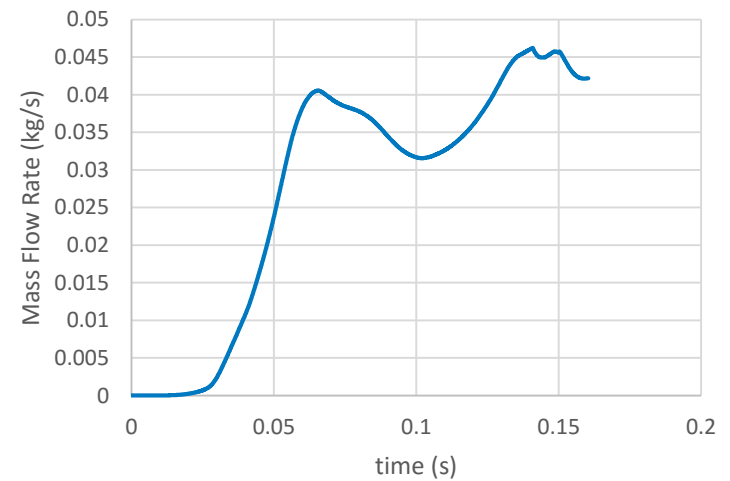
# CFD Mesh



# Trying a lower timestep...

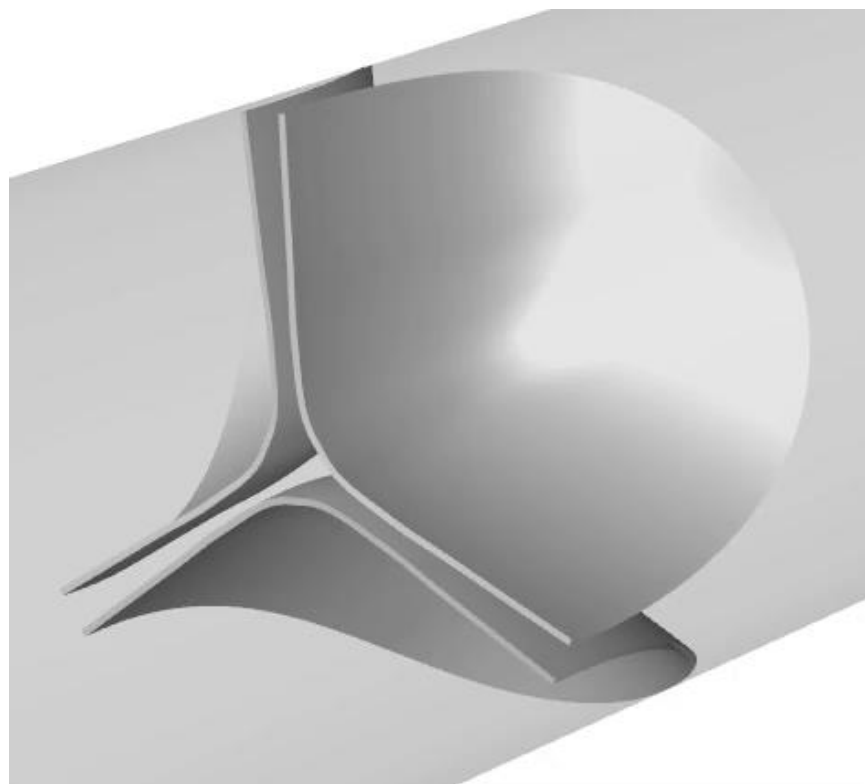
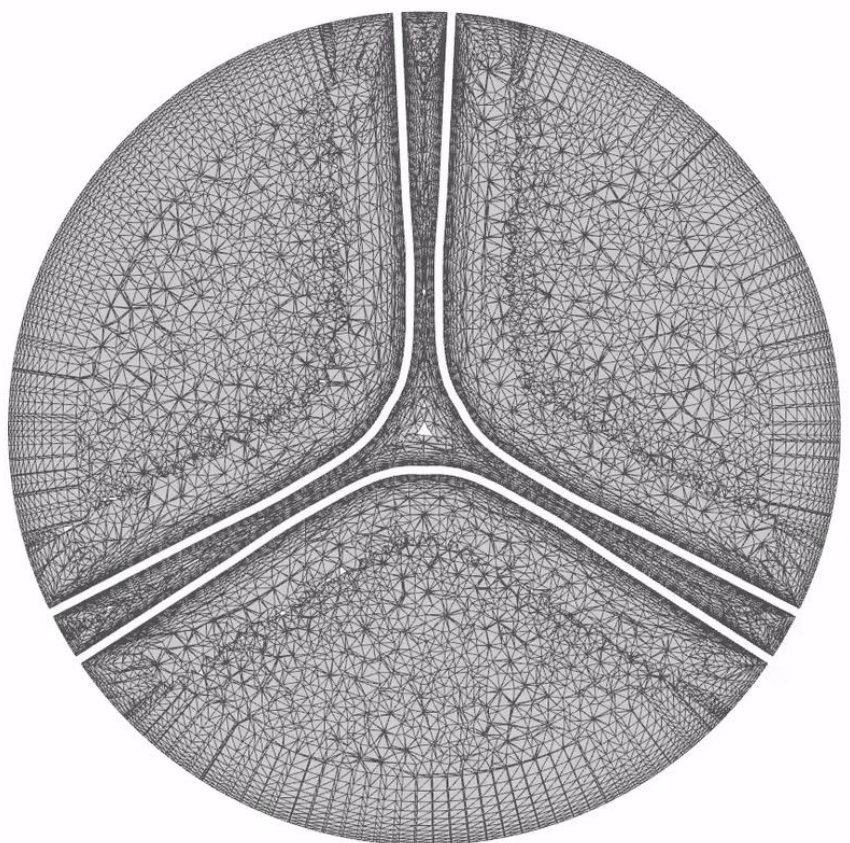


- Timestep decreased from  $2.5e-4$  seconds to  $8e-5$  seconds
- Case ran successfully
  - ✓ 2,000 timesteps
  - ✓ 14 cores
  - ✓ 94 hours (~4 days)





# Animations



# Appendix

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# Classification of cells

There are following cells:

## Dead cell :

Outside of computational domain

## Solve cell :

Equations are solved in this cell

## Receptor cell :

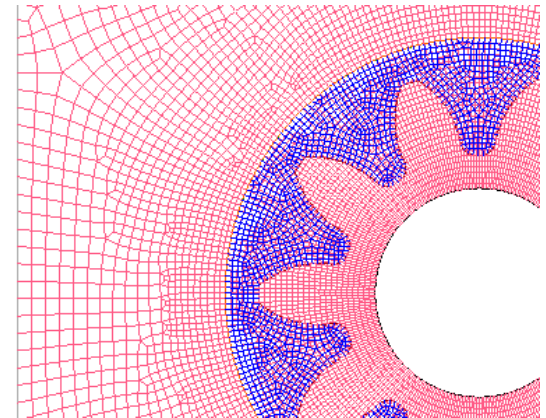
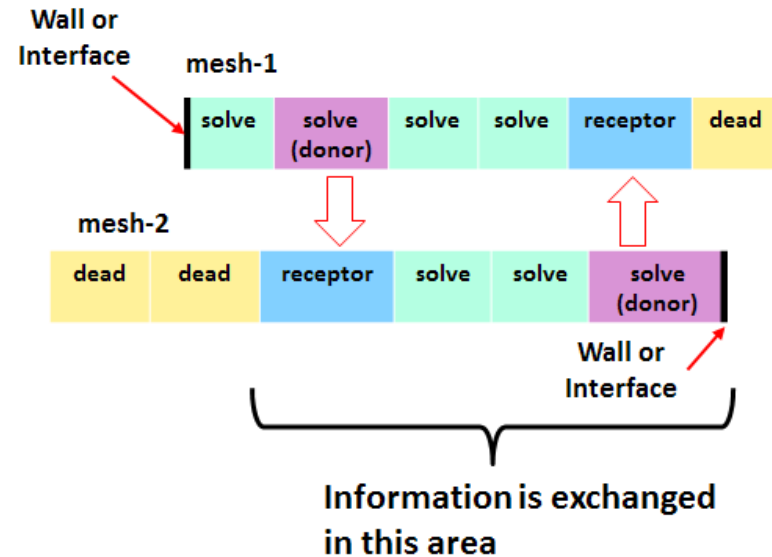
The data interpolated from other cell is received

## Donor cell :

The own data is transformed to receptor cell (a part of solve cell)

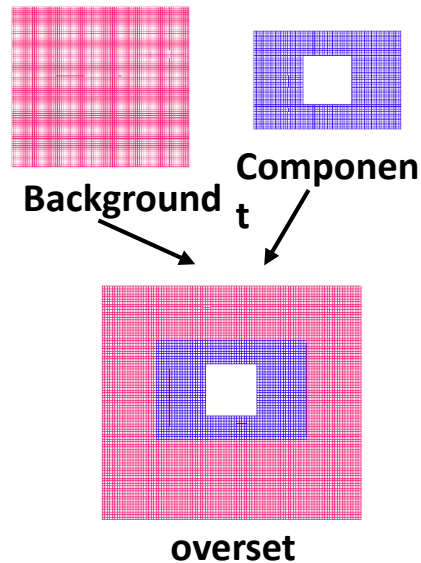
## Orphan cell :

When donor is not found, orphan cell occurs.

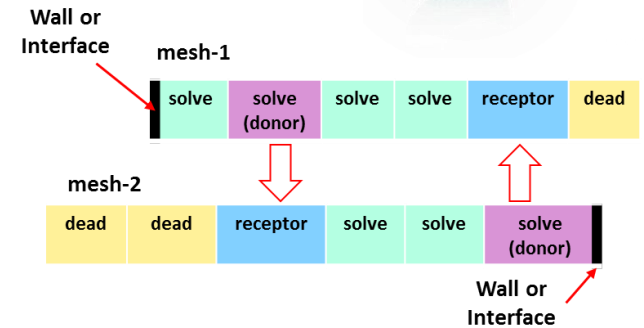
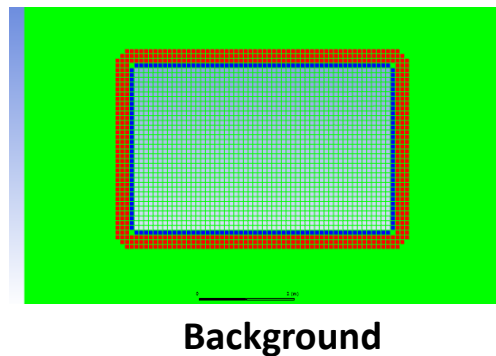
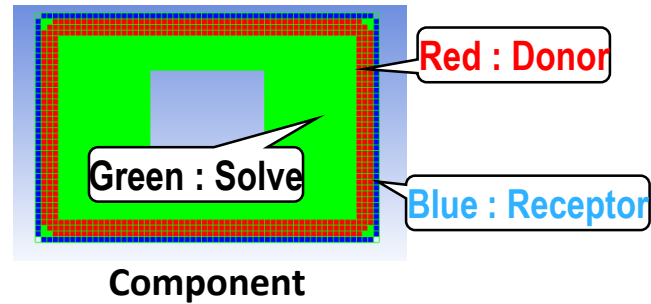


# Classification of cells : example

Example in following simple case



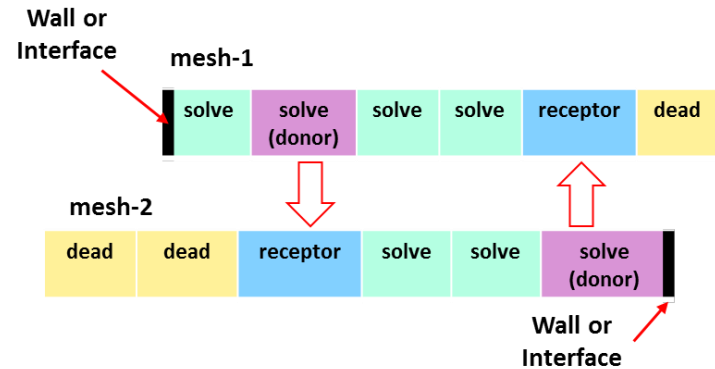
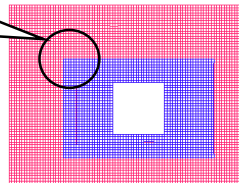
Cells is displayed by cell type



# Classification of cells : example

Overlapping area is zoomed up

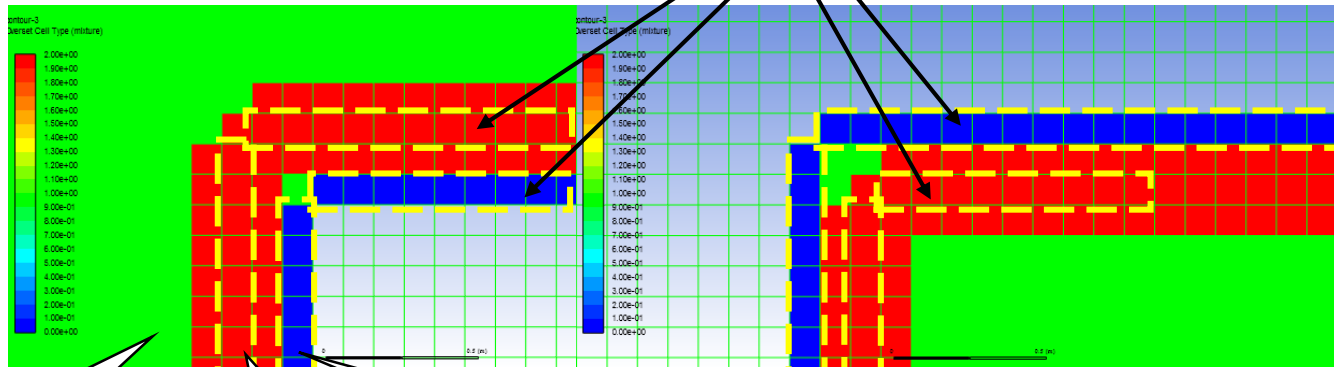
Closeup of this area



Donor and receptor match in this area.

Component

Background



Green : Solve

Red : Donor

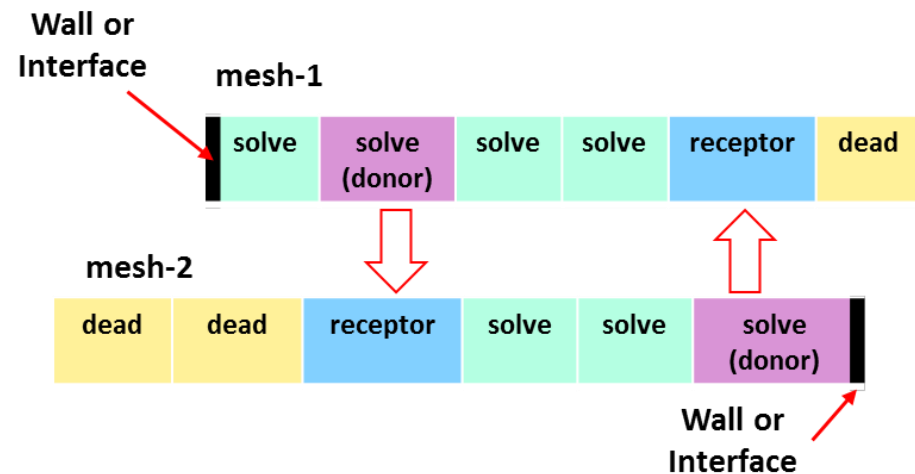
Blue : Receptor



# Classification of cells : how to check

You can confirm cell type by ID number.

| type     | number |
|----------|--------|
| donor    | 2      |
| solve    | 1      |
| receptor | 0      |
| orphan   | -1     |
| dead     | -2     |



In default number is displayed only from 1 to 2.

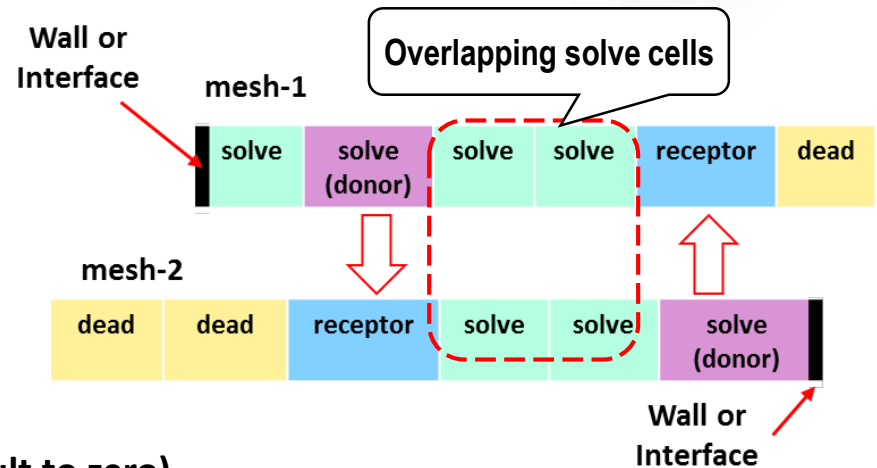
When you want to display orphan, please execute following TUI  
`define/overset-interfaces/options/render-receptor-cells?`

# Minimize of Overset

Solve cells are overlapping in red frame part.



Cells are solved redundantly  
→ it is a waste.



In default, overlapping is minimized (but difficult to zero)

\*If you need, you can deactivate minimize settings by TUI.  
define/overset-interfaces/options/minimize-overlap?

Overset interface is set considering minimization

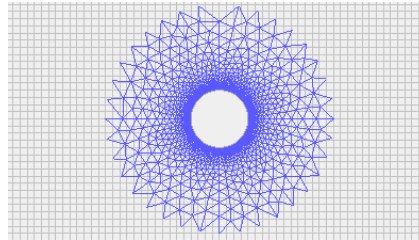
\*Overset interface is not always made nearby overset BC.  
(in case of cell volume base is used, overset interface is affected by volume)

# How to determine the mesh for calculation

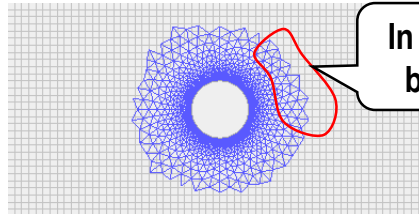
In default, smaller cells have high priority.

In following picture, small cells nearby wall in blue mesh have high priority.

→ that is, in overlapping area Fluent intends to solve smallest local cells.



Overset interface is made in area where mesh size are same between background and component mesh.



In this area cell size is as same between blue and gray zone.

→ Information on each zone is delivered well and analysis quality improved

# How to determine the donor priority

There are two approaches.

You can control location of overset interface by selecting appropriate way.

You can specify approach by TUI

`define/overset-interfaces/options/donor-priority-method`

A. Based on cell size (proportional to inverse of cell volume)

**In case of following case, this method has advantage.**

**Component : Mesh is fine in the vicinity of the wall, rough as leaving the wall**

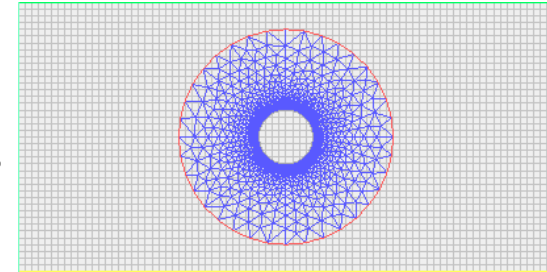
**Background : mesh size is as same to component (top right figure)**

B. Based on boundary distance (proportional to inverse of distance to nearest boundary)

**In case of following case, this method has advantage.**

**Component & Background : Mesh size is generally uniform and of similar size.**

**→ Minimize is work well in boundary based**



[0]: cell volume based

[1]: boundary distance based

# How to determine the grid priority



You can also set “grid priority” as each cell zones.

Grid priority can be set by using TUI.

**define/overset-interfaces/grid-priorities**  
“large number” = “high priority”

**\*if 2 zones have same value, donor priority is used in minimizing**

**If you set high priority in coarse mesh, you can solve in coarse mesh even if the donor priority is based on the cell size.**

**In case that mesh distributions are irregular, grid priority is helpful.**

**\*the grid priorities take precedence over the donor priorities.**



# Donor Search treatment

After setting priority, overset mesh is prepared by initialization according to below process.

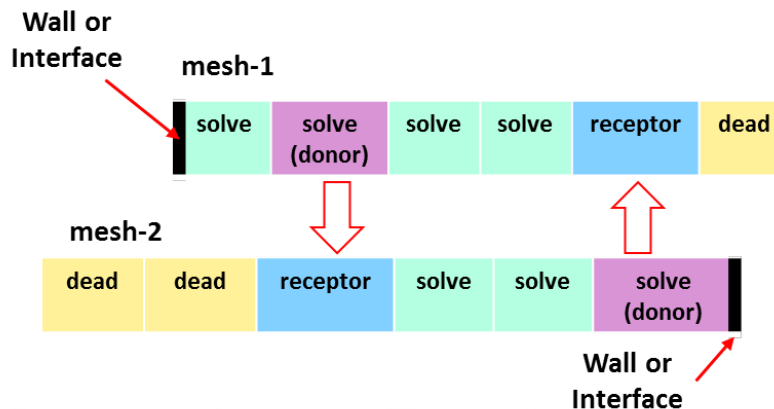
(1) Fluent searches other meshes for valid solve cells for each receptor.

(2) The solve cell containing the cell centroid of the receptor cell, along with its connected solve cells, are used as donor candidates for a given receptor.

\*Each receptor must have at least one valid donor cell.

\*at least 4 cells is necessary to certainly find donor cells.

\*in order solve cells find donor cells, receptor cells have to sufficiently overlap the other mesh.

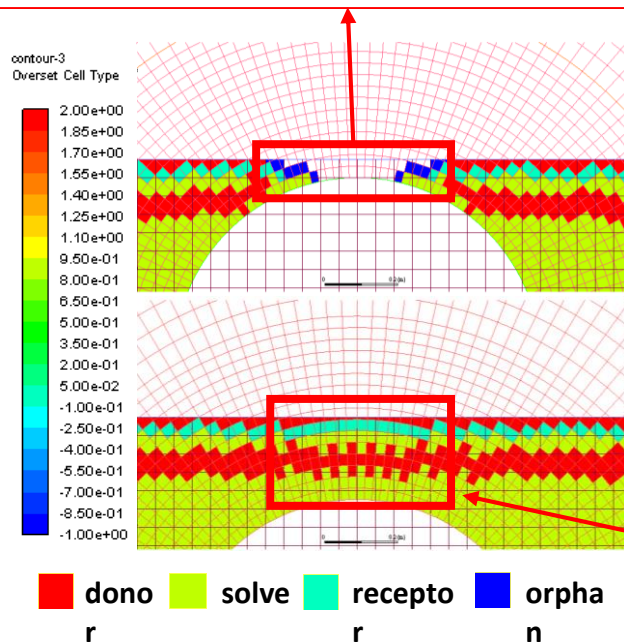


# Donor Search treatment : example

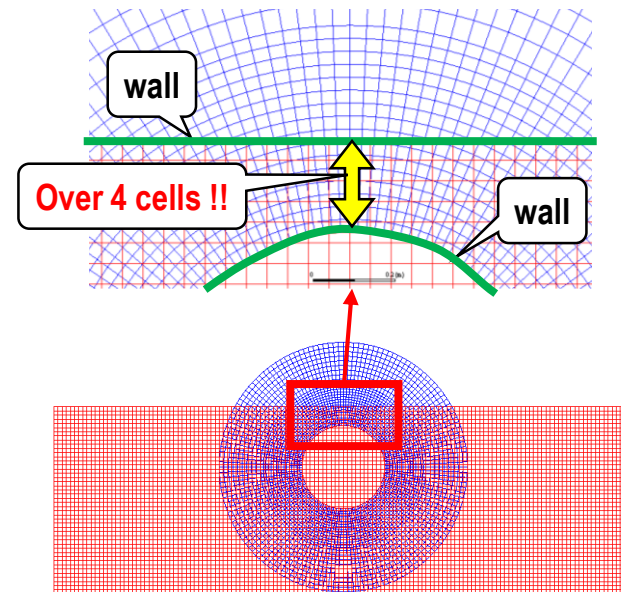
What will happen with less overlap?

Not-enough overlap leads orphan occurrence.  
In case it cause unintentional lack of solve cell.

WARNING: 10 oversight orphan cells in interface



Even if walls is close each other, 4 cells are necessary.



There is no problem,  
Because of enough overlap.  
(Over 4 cells)

# Post-processing oversight meshes

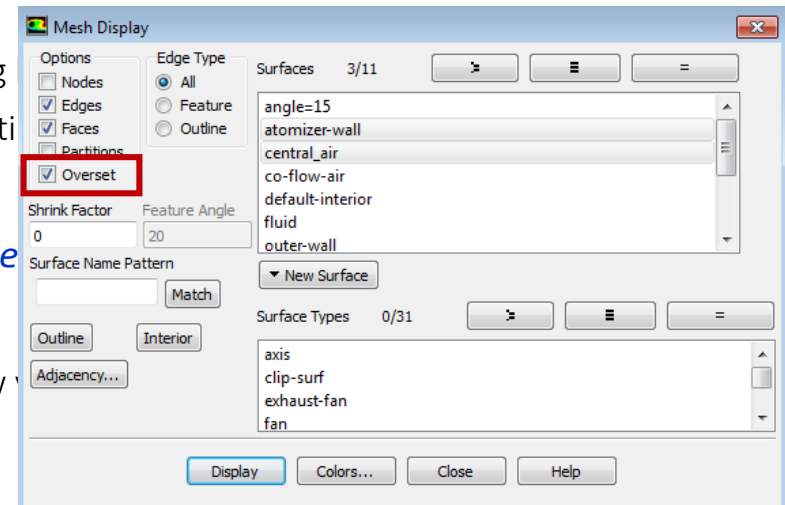
Setting Up Domain → Mesh → Display

## ■ Oversight mesh display

- ✓ If oversight option is enabled in the mesh display dialog default only solve and donor cells are show (when initia
- ✓ To display receptor cells  
[/define/overset-interfaces/options/render](#)  
[receptor-cells? yes](#)
- ✓ Turn off receptor visibility when creating plots of flow

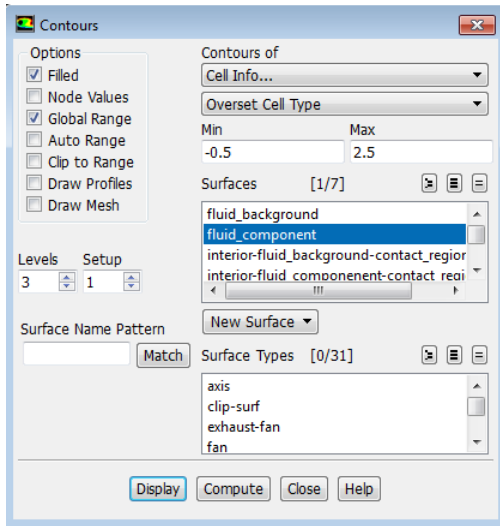
## ■ Oversight field function

- ✓ Oversight cell type function available in the cell info

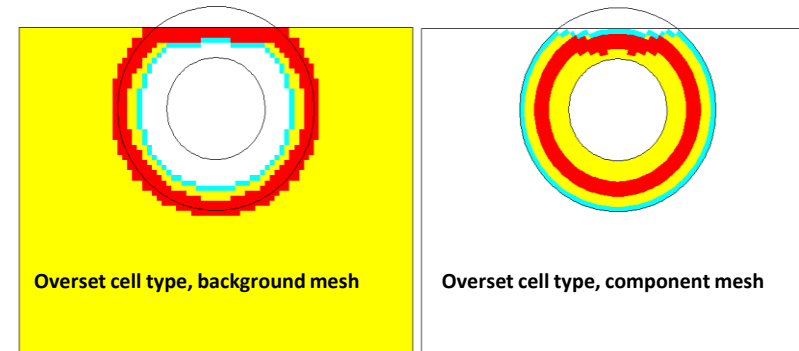
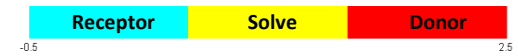


# Post-processing oversight meshes

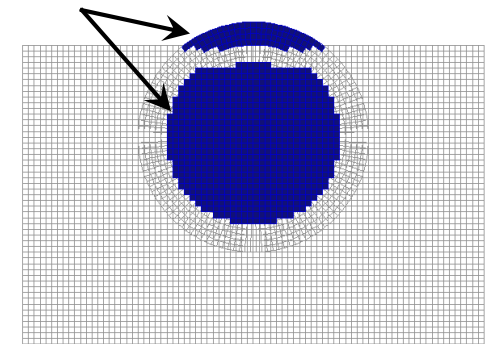
Postprocessing → Graphics → Contours → Edit...



| Cell Type | Integer Function Value |
|-----------|------------------------|
| Donor     | 2                      |
| Solve     | 1                      |
| Receptor  | 0                      |
| Orphan    | -1                     |
| Dead      | -2                     |



Marked Dead Cells



```
/define/overset-interfaces> mark-cells
Available marks: (solve receptor donor orphan dead mark0 mark1 custom)
Enter mark [solve] dead

Zone specific marks? [no]

Marked 1315 dead cells in register overset-dead-cells-r0.
```

# Post-processing oversight meshes



- **Overset cell marking**

- ✓ `/define/overset-interface/mark-cells`
- ✓ Cell type – solve, receptor, orphan or dead
- ✓ Use “manage registers” to visualize specific cell markings

- **Overset interface listing**

- ✓ `/define/overset-interface/list`
- ✓ `/define/overset-interfaces/options/verbosity 1 [0 2]`

- **Overset post-processing limitations**

- ✓ *Error reporting volume & surface integrals*
- ✓ *Double counting where solve cells overlap or boundary surfaces overlap*



# Post-processing oversight meshes

```
/define/overset-interfaces> list
```

**Verbosity = 0**

List of Oversight Interfaces

Interface Name: default-overset-interface

| Zone Type  | Name             | ID | Priority |
|------------|------------------|----|----------|
| Background | fluid_background | 5  | 0        |
| Component  | fluid_component  | 6  | 0        |

```
/define/overset-interfaces> list
```

**Verbosity = 1**

List of Oversight Interfaces

Interface Name: default-overset-interface

| Zone Type  | Name             | ID | Priority |
|------------|------------------|----|----------|
| Background | fluid_background | 5  | 0        |
| Component  | fluid_component  | 6  | 0        |

Interface Name: default-overset-interface

cell zone: id = 5

348 solve cells [contour value 1]  
54 donor cells [contour value 2]  
18 receptor cells [contour value 0]  
34 dead cells [contour value -2]

cell zone: id = 6

227 solve cells [contour value 1]  
80 donor cells [contour value 2]  
63 receptor cells [contour value 0]  
25 dead cells [contour value -2]

List of Oversight Interfaces

Interface Name: default-overset-interface

| Zone Type  | Name             | ID | Priority |
|------------|------------------|----|----------|
| Background | fluid_background | 5  | 0        |
| Component  | fluid_component  | 6  | 0        |

Interface Name: default-overset-interface

Background zone: id = 5, priority = 0

cut boundary zones = 8  
overset boundary zones =  
passive boundary zones =  
interior zones = 1

Component zone: id = 6, priority = 0

cut boundary zones = 9  
overset boundary zones = 7  
passive boundary zones =  
interior zones = 2

cell zone: id = 5

348 solve cells [contour value 1]  
54 donor cells [contour value 2]  
18 receptor cells [contour value 0]  
34 dead cells [contour value -2]  
2 receptor cells with principal donor not bounding cell

cell zone: id = 6

227 solve cells [contour value 1]  
80 donor cells [contour value 2]  
63 receptor cells [contour value 0]  
25 dead cells [contour value -2]  
5 orphan cells [contour value -1]  
6 receptor cells with principal donor not bounding cell

cell zone: id = 5

722 solve-solve faces  
28 solve-receptor faces  
9 receptor-receptor faces  
24 overset faces  
57 dead faces

cell zone: id = 6

452 solve-solve faces  
67 solve-receptor faces  
59 receptor-receptor faces  
67 overset faces

# Supported Features and Limitations

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# Function table of overset-1



## Functions availability in recent 3 releases

|                            |                    | R18.1      | R18.2      | R19.0      |
|----------------------------|--------------------|------------|------------|------------|
| 2D                         |                    |            |            |            |
|                            | Planar             | OK!        | OK!        | OK!        |
|                            | Axisymmetric       | OK!        | OK!        | OK!        |
|                            | Axisymmetric Swirl | no-support | no-support | no-support |
| 3D                         |                    | OK!        | OK!        | OK!        |
| Steady                     |                    | OK!        | OK!        | OK!        |
| Transient                  |                    | OK!        | OK!        | OK!        |
| Energy                     |                    | OK!        | OK!        | OK!        |
| Single phase               |                    | OK!        | OK!        | OK!        |
| VOF                        |                    | OK!        | OK!        | OK!        |
| Mixture                    |                    | no-support | no-support | OK!        |
| AMG option                 |                    | All        | All        | All        |
| FAS mltigrid               |                    | no-support | no-support | no-support |
| Mesh type                  |                    | All        | All        | All        |
| Closed domain              |                    | no-support | no-support | no-support |
| UDS                        |                    | no-support | no-support | OK!        |
| UDF (dedicated loop macro) |                    | no-support | no-support | OK!        |

**\*unless otherwise specified features and models is unsupported**

# Function table of overset-2

|              |                      | R18.1      | R18.2      | R19.0      |
|--------------|----------------------|------------|------------|------------|
| Turbulence   |                      |            |            |            |
| k-e          | Standard             | OK!        | OK!        | OK!        |
|              | RNG                  | no-support | no-support | OK!        |
|              | Realizable           | no-support | no-support | OK!        |
| k-w          | Standard             | OK!        | OK!        | OK!        |
|              | BSL                  | no-support | OK!        | OK!        |
|              | SST                  | △          | OK!        | OK!        |
| Multiphase   |                      |            |            |            |
| VOF          | Openchannel          | OK!        | OK!        | OK!        |
|              | WaveBC               | OK!        | OK!        | OK!        |
|              | Cavitation           | no-support | no-support | OK!        |
|              | Evaporate / Condense | no-support | no-support | OK!        |
| Mixture      | non-Granular         | no-support | no-support | OK!        |
|              | Granular             | no-support | no-support | no-support |
|              | Cavitation           | no-support | no-support | OK!        |
|              | Evaporate / Condense | no-support | no-support | OK!        |
| DynamicMesh  |                      |            |            |            |
|              | Rigid body movement  | OK!        | OK!        | OK!        |
|              | Spring               | OK!        | OK!        | OK!        |
|              | Remesh               | no-support | no-support | no-support |
|              | Layering             | no-support | no-support | no-support |
| Sliding Mesh |                      | OK!        | OK!        | OK!        |

**\*unless otherwise specified features and models is unsupported**

# Function table of overset-3

|                     |                                | R18.1      | R18.2      | R19.0      |
|---------------------|--------------------------------|------------|------------|------------|
| Boundary conditions |                                | All *1     | All *1     | All *1     |
| Cell zone           |                                |            |            |            |
|                     | Solid region                   | OK! *2     | OK! *2     | OK! *2     |
|                     | Porous media                   | no-support | no-support | no-support |
|                     | SourceTerm                     | OK!        | OK!        | OK!        |
|                     | Fixed Value                    | OK!        | OK!        | OK!        |
|                     | MRF                            | no-support | no-support | OK!        |
| Interface           |                                |            |            |            |
|                     | non-conformal                  | no-support | no-support | no-support |
|                     | Periodic                       | no-support | no-support | no-support |
|                     | OversetInterface in background | no-support | no-support | no-support |
| initialization      |                                |            |            |            |
|                     | Standard                       | OK!        | OK!        | OK!        |
|                     | Hybrid                         | OK!        | OK!        | OK!        |
|                     | FMG                            | no-support | no-support | no-support |

**\*1 : following types are enable in zone that is not participating in an overset interface**  
**external boundary : exhaust fan, inlet vent, intake fan, outlet vent**  
**internal boundary : fan, porous-jump, radiator**  
**\*2 : impossible to set overset interface in solid fluid interface.**

**\*unless otherwise specified features and models is unsupported**



# Function table of overset-4

|                |                       | R18.1                    | R18.2        | R19.0        |
|----------------|-----------------------|--------------------------|--------------|--------------|
| Pressure based | Velocity Formulation  | Absolute                 | OK!          | OK!          |
|                |                       | Relative                 | no-support   | no-support   |
|                |                       | Green-gauss Cell-Based   | OK!          | OK!          |
|                |                       | Least-Squares Cell Based | OK!          | OK!          |
|                |                       | Green-gauss NodeBase     | no-support   | no-support   |
|                |                       | Pressure                 | All          | All          |
|                |                       | Spatial schemes          | 1st, 2nd     | 1st, 2nd     |
|                |                       | P-V coupling             | Coupled only | Coupled only |
|                |                       | Pseudo transient         | OK!          | OK!          |
|                | Transient formulation | Stationary mesh          | All          | All          |
|                |                       | Moving mesh              | 1st only     | 1st only     |
|                |                       | R18.1                    | R18.2        | R19.0        |
| Density based  | Velocity Formulation  | Absolute                 | OK!          | OK!          |
|                |                       | Relative                 | -            | -            |
|                |                       | Green-gauss Cell-Based   | OK!          | OK!          |
|                |                       | Least-Squares Cell Based | OK!          | OK!          |
|                |                       | Green-gauss NodeBase     | no-support   | no-support   |
|                |                       | Convective flux types    | All          | All          |
|                |                       | Spatial schemes          | 1st, 2nd     | 1st, 2nd     |
|                |                       | Pseudo transient         | OK!          | OK!          |
|                | Transient formulation | Stationary mesh          | All          | All          |
|                |                       | Moving mesh              | 1st only     | 1st only     |

# Overset Mesh – Limitations @ R19.0



- **Overset interfaces cannot contain solid cell zones**
- **Component meshes cannot be connected to a non-conformal interface**
- **Background meshes cannot have non-conformal interfaces between them if they are part of the same overset interface**
- **Component zones cannot have periodic boundary conditions**
- **Background zones cannot have overset boundaries**
- **Component mesh boundaries cannot overlap with coupled walls**
- **Overset meshing is not compatible with remeshing or layering (dynamic mesh)**
- **FMG initialization is not available**
- **Contact detection cannot be used in overset cases**
- **Overset meshing is not supported for closed domains**
- **Node weights for node-based gradients in postprocessing is not available (when you use polyhedral mesh)**

*For complete list refer to online document: [Overset Meshing Limitations and Compatibilities](#)*

# 感谢聆听！

